Debt Deflation and the Rise of the Nazi Party*

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Abstract

This paper examines the political consequences of debt deflation in interwar Germany. Debt deflation arises when falling prices increase the real burden of pre-existing nominal liabilities. We study this mechanism in the agricultural sector, where farmers had accumulated substantial nominal debt before 1929. In the face of collapsing agricultural prices and falling revenues, the high nominal interest burden made this debt unsustainable. To isolate the political effect of this shock, we exploit pre-crisis differences in agricultural debt and product mix across counties to construct a measure of debt deflation intensity. Our main finding is that rural debt deflation substantially increased support for the Nazi party, reflecting substitution away from agrarian and conservative parties. A one-standard-deviation increase in exposure explains a fifth of one standard deviation in the Nazi party vote share rise between 1928 and 1932. The effect persists after controlling for income shortfalls, unemployment, and austerity, indicating that debt deflation drove radicalization independently of concurrent channels. A counterfactual exercise suggests that without debt deflation, the Nazi party's national vote share would have been insufficient to prevent less extreme parties from forming a majority coalition against it, rendering rural debt deflation a plausibly necessary condition for Hitler's rise to power.

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1 Introduction

What are the costs of deflation? A key lesson from the Great Depression is that deflation is especially damaging in highly leveraged economies (Bernanke 1995). Debt deflation arises from the interaction of pre-existing nominal liabilities and falling prices. Consider two farmers facing the same fall in crop prices: one debt-free, the other heavily indebted. The first suffers an income loss; the second faces the same income loss plus a rising real debt burden, threatening foreclosure. It is this combined character that makes debt deflation a distinct and particularly potent source of economic hardship—it generates grievances that go beyond income loss, making anti-system appeals more attractive.

We examine this mechanism through the lens of the German interwar agricultural sector. The case is particularly well-suited because of its historical relevance and because it presents an unambiguous case of debt deflation. First, agriculture remained economically and politically important in Weimar Germany, still employing roughly one third of the workforce. Gaining rural support was thus a precondition for the rise of the Nazis. Second, after virtually being debt-free at the end of hyperinflation, farmers had accumulated large nominal debts by 1928, amounting to twice their annual income, on average. Like others, German farmers were subsequently exposed to the rapid general price decline. The simultaneity of falling farm incomes and constantly high interest service rendered the debt burden unsustainable. Using a sectoral, national-level debt decomposition, we show that the German interwar agricultural sector indeed presents a textbook case for debt deflation.

To identify the effect of debt deflation on political radicalization, however, we require a local measure of debt deflation that is not tainted by contemporaneous local political conditions. To this end, we exploit county-level variation in the two components that jointly determined the severity of the shock. First, counties differed in their exposure to nominal agricultural debt at the onset of the Great Depression, measured by pre-1929 agricultural debt. Second, counties differed in their exposure to agricultural price deflation depending on their product mix. Combining these sources of variation, we construct a county's exposure to debt deflation intensity as the implied change in agricultural leverage during 1929–1932: the changes in the numerator originate in interest accruing on the pre-deflation debt stock, while the changes in the denominator evolve from predicted income changes driven by national-level commodity price declines. Because the two elements of the exposure are anchored in pre-crisis debt and national price shocks, they are credibly exogenous to contemporaneous local political conditions. Our measure does not predict radical-right voting before the Great Depression, addressing concerns about pre-existing trends. However, it strongly predicts foreclosures—the most severe grievance farmers could face.

Our central finding is that rural debt deflation substantially increased support for

the NSDAP. Counties experiencing larger debt-deflation shocks shifted electoral support away from agrarian and conservative parties and toward the Nazis between 1928 and 1932. The estimated effects are economically meaningful: a one-standard-deviation increase in debt deflation exposure explains 20% of one SD in the rise in the NSDAP vote share over this period. We formulate a counterfactual exercise, assuming that debt deflation could have been avoided. We find that without rapid debt accumulation and subsequent deflation in the countryside, the NSDAP's national vote share in July 1932 would have been sufficiently lower to allow all other parties but the Communists to form a majority coalition against it. Arguably, this makes rural debt deflation a necessary condition for the Nazis' rise to power.

In a second step, we explore whether the Nazis' rise in the countryside constituted a general drift to extremism (such as in urban areas) or a substitution away from the traditional farmer-oriented parties. Consistent with historical accounts that Communist support was primarily urban and stemming from industrial workers, we find no comparable increase in support for the Communists in counties more exposed to debt deflation. Nor did the overindebtedness lead to a significantly negative effect on the support for the Weimar coalition—the coalition of social democrats, Christian democrats, and the centrist DDP. Instead, our results are consistent with the idea that the Nazi party unified support from both traditional conservative farmer parties and the scattered local protest parties that had emerged during the 1920s. Our results suggest that a 1 SD change in the leverage ratio led to a 16% fall in support for the agrarian parties, mirroring the gains of the Nazi party. Additional results suggest that official government support programs did not sway the farmers towards the more centrist parties.

Finally, we explore the possibility of alternative economic channels and the relative roles of income and debt. First, while the farmers' tax burden was a central concern in the mid-1920s, the burden had already significantly decreased before the Nazis' actual rise. Consistently, we do not detect an effect of austerity-driven tax increases (Galofré-Vilà et al. 2021). Second, we also find no evidence for an effect of rural unemployment on the vote share of the Nazis, a finding that mirrors much existing work (Falter 1991; King et al. 2008). Third, proxying income with data on sales for a subset of the sample does not affect the economic and statistical significance of our results regarding the importance of the leverage ratio. Finally, we confront the question whether either component of our predicted leverage ratio—debt in the numerator and income in the denominator—was the sole driver of the result. We show that, if anything, initial debt seemed more important than income, but that the explanatory power derives from the combination of the two. We therefore conjecture that the grievance caused by the unsustainable debt is qualitatively different from that of an income shock and other crisis channels.

Our contribution to the literature on the Great Depression and the rise of the NSDAP[1]

[1] A substantial body of research relates the rise of the Nazi party to war legacies (De Juan et al. 2023;

is to isolate the political consequences of debt deflation, a central economic mechanism of the Depression (Fisher 1933). The studies most directly related to ours show that economic hardship—whether through retrospective economic voting (King et al. 2008), financial-sector disruptions (Doerr et al. 2022), debt (Falter 1992), austerity (Galofré-Vilà et al. 2021), or the trade collapse (Brey and Facchini 2024)—contributed to Nazi electoral gains. The latter two papers also cover the agrarian dimension: Galofré-Vilà et al. (2021) find that austerity had larger effects in rural districts, and Brey and Facchini (2024) examine the impact of the trade collapse on the Hinterland. We complement these explanations by exploiting within-sector heterogeneity in debt-deflation exposure across rural counties. We show that debt-deflation exposure robustly predicts the rural shift toward the NSDAP, even after controlling for alternative channels like income decline, unemployment, and austerity.

Beyond the German case, our results contribute to the micro-level evidence on the historical crisis–radicalization link documented across the interwar period by De Bromhead, Eichengreen, and O'Rourke (2013), across 140 years by Funke, Schularick, and Trebesch (2016), and surveyed by Guriev and Papaioannou (2022, section 5.2). Existing micro-studies identify a range of mechanisms: Doerr et al. (2022) show that bank failures amplified income losses and fueled radicalization; crucially, the political backlash was especially strong where economic distress could be channeled into anti-Semitic scapegoating. Braggion, Manconi, and Zhu (2020) show that credit contraction in 1930s China fueled labor unrest and Communist party penetration among urban factory workers, illustrating that the direction of radicalization depends on which political movement credibly addresses the grievances of those hit. In rural Germany, by contrast, the Communists' urban focus left indebted farmers without a political home on the left, creating the opening the NSDAP exploited with its agrarian program and propaganda. Identifying the specific mechanisms that translate crises into political backlash matters for policy: appropriate responses depend on whether radicalization is driven by income loss, credit contraction, or debt deflation. Yet a common challenge is that crises bundle these shocks together, making attribution difficult. Our setting allows us to isolate Fisherian debt deflation and separate it from concurrent channels—providing clean evidence that rising real debt burdens driven by price collapses independently predict anti-establishment voting.

The remainder of the paper is organized as follows. Section 2 provides historical background on agriculture and rural politics in Weimar Germany. Section 3 describes the data and introduces our county-level measure of debt deflation exposure. Section 4 presents the baseline effects of debt deflation on electoral outcomes and examines the role of alternative channels and potential confounders. Section 5 concludes.

Koenig 2023), cultural persistence (Voigtländer and Voth 2012), NSDAP strategies (Adena et al. 2015; Satyanath, Voigtländer, and Voth 2017; Caesmann et al. 2021), and religion (Spenkuch and Tillmann 2018; Becker and Voth 2023).

2 Historical background: Agrarian crisis and politics

This section provides historical background on interwar German agriculture. It documents the evolution, scale, and underlying reasons for both debt accumulation and deflation by farmers (Section 2.1). It then discusses the governing parties' inability to solve the farmers' misery and the NSDAP's strategy to capitalize on it (Section 2.2).

2.1 The origins and evolution of the agrarian debt crisis

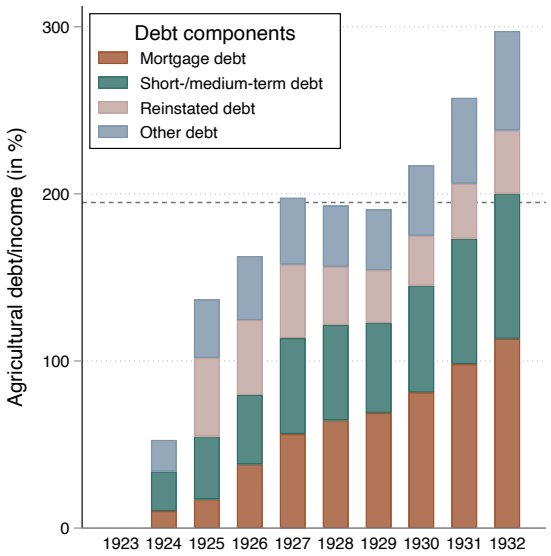
Leverage is a double-edged sword. On the one hand, well-developed financial markets allow firms, farms, and households to take up debt in order to make productive investments and to smooth out negative income shocks. On the other hand, too much leverage might eventually lead to unsustainable debt burdens and result in a debt crisis with economic hardship and foreclosures. Which of the above features were present in the German farm sector in the 1920s? Why did deflation make the debt unsustainable?

Figure 1 confronts these questions by introducing data on the evolution of agricultural debt. Figure 1a decomposes the leverage (debt-income ratio) by the type of debt (mortgage, short-/medium-term debt, reinstated and other debts). It also reports the corresponding pre-war level as a dashed line. Figure 1b provides a standard decomposition that allows us to attribute the changes in the farmers' leverage ratio to five potential drivers (primary balances, reinstated debts, interest payments, income growth, in-/deflation). Figure 1c depicts the growing wedge of interest service and farm incomes in constant Reichsmarks of 1928 and Figure 1d reports the evolution of foreclosure auctions. In the following, we use these data to assess debt sustainability during the period of debt accumulation (1924-1929) and debt deflation (1930-1932).

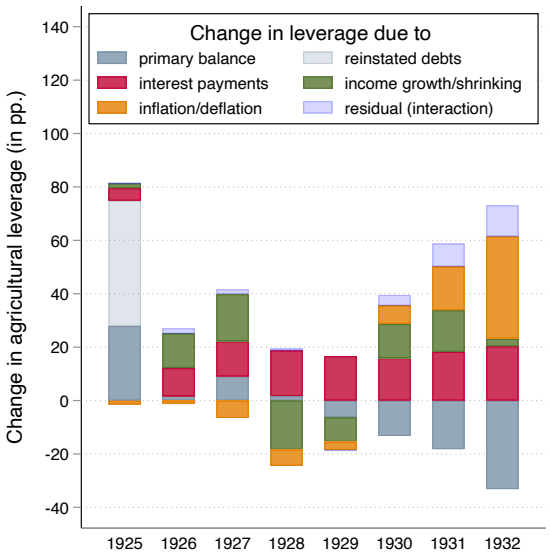
Debt accumulation, 1924–1929 Unlike many other debt crises, the prelude to the agrarian debt crisis started with a clean slate. After currency stabilization in late 1923, most German farmers were virtually debt-free. They had repaid the substantial prewar debt with worthless paper marks (Wehler 2008, p. 282 and Nipperdey 1998, pp. 201-202). Even after pre-war mortgages were reinstated at 25% of their old value in 1925, it remained true that, relative to other groups in society, farmers had been winners of the hyperinflation (Albers, Bartels, and Schularick 2026). By 1927, farmers had attained the pre-war debt levels and leverage (dashed line in Figure 1a). Figure 1b shows that this increase was indeed due to debt uptake (primary deficits) and the reinstatement of pre-hyperinflation debts rather than shrinking incomes. In 1928 and 1929, income growth counteracted the rising interest burden (Figure 1c) and the frequency of foreclosures stabilized (Figure 1d) slightly above pre-war levels (Kokotkiewicz 1932, p. 13; using Prussian data). Notwithstanding its high level, the debt stock did not necessarily appear unsustainable on the face of it. However, two underlying factors point to the fragility of

Figure 1: The evolution of agricultural debt, 1924–1932

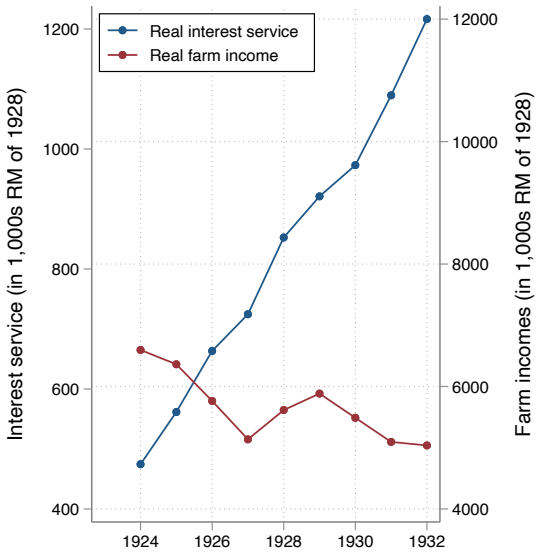
(a) Leverage and debt composition



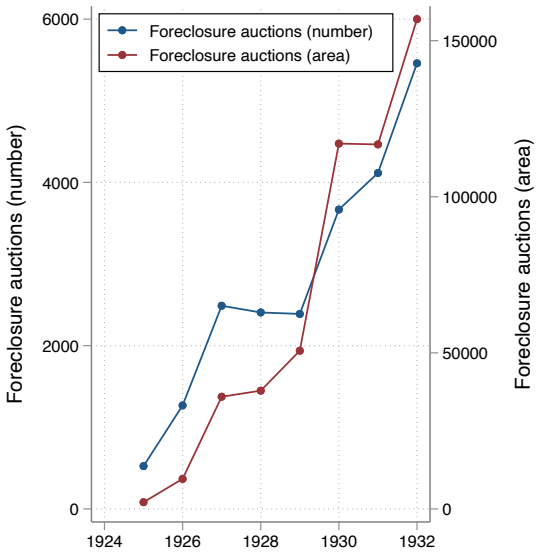
(b) Drivers of leverage



(c) Real incomes and interest service



(d) Foreclosure auctions



Notes: Panel a shows the ratio of debt over income in the agricultural sector. The residual group of hard-to-measure 'other debts' includes tax arrears and informal personal loans. Panel b provides a decomposition of its changes following Mason and Jayadev (2014). The residual is due to interactions among i, g, and π that are not accounted for by the linear approximation. Panel c shows interest payments and farm incomes deflated by the national income deflator. Panel d reports the number and area covered by foreclosure auctions. See Appendix A for all sources and calculations.

the debt even when the debt-income ratio stabilized in 1927–1929.

First, the sustainability of debt also depends on the productivity of the investments carried out with the acquired funds. In fact, policymakers encouraged borrowing to increase productivity since the war had depleted livestock and led to underinvestment in land and machinery (James 1988; Enquete Commission 1930, p. 246). However, in the end, only around 21% of the debt uptake was used for investments in machinery and livestock (Enquete Commission 1930, pp. 89 & 91). Another motive for debt-uptake, income-smoothing, was more significant. Incomes fell short for two reasons. Higher taxes were imposed on farmers in the Weimar Republic than in the pre-war period, and it was common practice to take up debt to pay them (Becker 1990, p. 233 and Stucken 1930, p. 250). Additionally, while incomes grew, they did so at a rate below expectations as cheap grains from the Americas flooded the German market, which had hitherto been protected by tariff barriers (Bissing 1929). The resulting income shortfall meant that some farmers also took up debt to cover living expenses. On balance, comparatively little of the debt uptake was directly invested into productive means.

The second factor affecting debt sustainability was high interest burdens. On average, farmers in western and eastern Germany used 9% and 15% of their cash income from sales, respectively, to pay interest on their debt. Interest rates varied between 10.5% for mortgages and 24% for short-term loans (Bauer 1939, p. 24). Mortgage loans were only issued to a very limited extent until 1925 (see Figure 1a) when Germany regained access to international capital markets, and even afterwards, interest rates remained high (Wagemann 1929, p. 202). Besides the high demand for credit, the disruption of the traditional rural credit intermediation by the hyperinflation played a key role in these high rates. Before World War I, specialized rural lenders and cooperatives helped match local credit demand with local funding. This limited reliance on the broader money market as indicated by substantial interest rate differentials across geographic areas (Enquete Commission 1930; Wolters 2008).[2] Hyperinflation wiped out deposits and undermined this model, because the cooperatives now had to borrow on the national and international markets, making interest rates more dependent on external refinancing and on tight economy-wide capital market conditions (Enquete Commission 1930).[3] Even though interest rate differentials continued to exist across space, the larger reliance on external finance meant that the local supply depended more heavily on national-level credit conditions (Enquete Commission 1930, pp. 79f). The general lack of capital in the German economy (James 1988) resulted in high nominal interest rates, especially for short- and medium-term debt. Tight, not loose, credit contributed to high debt ratios, and the real interest burden rose steadily even when the debt-income ratio stabilized and

[2] For background on the prewar cooperative credit model and its role in rural finance, see Enquete Commission (1930) and Guinnane (2001).

[3] As a case in point, the large Association of Prussian Cooperatives Bank (*Preussische Zentralgenossenschaftskasse*) turned from a net creditor into a net debtor (Enquete Commission 1930, pp. 53 & 79).

the primary balance was positive (Figure 1c).

Debt deflation, 1930–1932 After the stabilization of the farmers' debt-income ratio at around 200% in 1927–1929, the ratio increased sharply in the three following years, even though the nominal debt level remained, by and large, constant. This increase can be best understood through the lens of Fisher's debt deflation theory. His theory rests on the insight that nominal debt contracts of households and businesses are sticky while incomes and net worth are not (Fisher 1933). A fall in income and prices leads to an increase in leverage and difficulties in servicing interest, with fire sales and bankruptcies being the ultimate results.

Figure 1b highlights that three factors drove agricultural debt to unsustainable levels: falling incomes, high nominal interest payments, and deflation. The nominal interest burden remained high and stable (Bauer 1939, p. 56). At the same time, the general price level fell as Germany clung to the gold standard and the prices of agricultural goods fell even more (Eichengreen 1992; Federico 2005; Wolf 2008). This meant that, with yields relatively stable (though below pre-war levels; see Ziemann 2022, p. 501), the farmers' income decreased. As the combined outcome of these three factors, real interest payments increased as real farm incomes fell from 1929 to 1932 (Figure 1c). A survey of farmers' accounting books shows that only around 20% of farmers in eastern and 30% in western Germany made enough profits to fulfill their interest obligations in 1932 (Deutsche Rentenbank-Kreditanstalt 1932, p. 33). In consequence, foreclosure auctions increased both in number and area covered (Figure 1d).[4]

In sum, the German agricultural debt crisis evolved in two phases. In the first phase, farmers accumulated debts to make investments and smooth income shortfalls. Starting from virtually zero, the debt-income ratio had reached its pre-war levels within five years. Only around a fifth of this new debt was invested into productive uses like machinery, with the rest being used for income-smoothing, including for paying new taxes. The lack of a well-functioning credit market added to the expenses as interest rates were high, casting doubt about debt sustainability as early as 1929. When prices and incomes fell in the wake of the Great Depression, but nominal debt burdens remained unchanged, the debt burden became unsustainable, and bankruptcies became widespread. This ultimate consequence—giving up the very existence as a farmer—also underscores the difference between an income and debt shock. While adjusting consumption temporarily may be sufficient to balance an income shock, high leverage and ensuing high interest payments make this option infeasible.

[4] Importantly, these auctions represent only the tip of the iceberg, as family members on other farms often assumed outstanding debts, which in turn frequently led them into financial distress (Kokotkiewicz 1932, p. 12).

2.2 Rural politics and the NSDAP's turn to the countryside

The agrarian crisis of the late Weimar period coincided with heightened political volatility in the countryside. Rural voters had long been mobilized through conservative parties, but the late 1920s debt crisis and price collapse weakened established alignments and increased receptiveness to anti-system appeals. In Protestant regions, the DNVP had traditionally represented large parts of the rural electorate and, with its vocal support for tariffs, achieved a strong electoral result in 1924. Yet, while participating in several coalition governments until 1928, it was largely unable to deliver more than modest protective measures under pressure from better-organized, export-oriented industries and coalition partners wary of higher food prices (Gessner 1977, p. 14). The re-establishment of the pre-war tariff schedule in 1925 revealed the underlying dilemma: strong opposition came from labor-oriented factions within the governing Catholic *Zentrum* party (James 1988, p. 259). Occasionally, governments resorted to more direct market regulation. Most notably, the compulsory domestic milling quota (*Mahlzwang*) required mills to process increasing shares of domestically produced wheat—eventually rising to 97% by 1931/32—and contributed to stabilizing wheat prices (van Strakosch 1932, p. 166).[5]

Such measures were, however, narrow in scope. The predicament of the farm sector was well understood at the time, reflected both in a parliamentary inquiry (Enquete Commission 1930) and in substantial intragovernmental discussion (Abraham 1981). Yet, this recognition did not translate into broad-based relief. Many farmers, therefore, continued to regard parliamentary protection as insufficient. Against this backdrop, the DNVP lost ground from 1928 onward and exited government, while non-parliamentary mobilization gained traction. As a case in point, the *Landvolk* movement in northern Germany organized mass protests (around 140,000 farmers in 17 cities in 1928) and helped spur local agrarian protest lists across Germany (Heberle 1963). Disappointment with parliamentary protection thus eroded established loyalties and made rural protest politics increasingly attractive.

With tariff policy politically constrained and rural discontent escalating, Weimar governments increasingly turned to administrative and fiscal measures to address the debt overhang. From the late 1920s onward, the central government expanded a large subsidy and debt-restructuring program known as *Osthilfe* (Aid for the East), aimed primarily at East Prussia. Its core instruments were new credit, conversion of high-interest into low-interest debt, and credit subsidies (James 1988, p. 261; Bauer 1939, p. 36). By 1931, spending reached roughly 2 billion Reichsmark (Wehler 2008, p. 283), a substantial share of the central-government budget of around 19.7 billion Reichsmark (Weitzel 1967). Yet, *Osthilfe* did not resolve the crisis: consolidation of short-term debts remained incomplete (James 1988, p. 267), funds disproportionately flowed to the most

[5] For an overview of price declines by crop, see Appendix Figure B.2. Note that we exploit this variation between products for identification in Section 4.

indebted and least productive farms, and allocation favored large estates, with only a small fraction of applicants receiving aid (Wehler 2008, p. 282). Allegations of corruption further undermined the program's political returns (Treue 1992, p. 592). In addition to the *Osthilfe*, emergency decrees in the early 1930s effectively exempted the agricultural sector from income tax (Statistisches Reichsamt 1936, p. 3). Finally, emergency decrees also imposed interest ceilings and strengthened debtor protections, but they strained lender confidence and further tightened the supply of agricultural credit (Bissing 1933, p. 102). Taken together, the combination of constrained trade policy, poorly targeted relief, and credit-market interventions did not durably restore rural prosperity—and instead reinforced perceptions of governmental incapacity.

The NSDAP's rural breakthrough rested less on a coherent early agrarian program than on a flexible, grievance-based attack on the Weimar system that could be translated into rural politics through local intermediaries and only became more systematic after 1928 (Ziemann 2022; Grill 1982, p. 515). In its early phase, Nazi campaigning in rural districts was largely driven by local and regional initiatives and, where present, often (ironically) reflected the party's left wing under Gregor Strasser rather than a coherent national rural platform (Grill 1982). In the run-up to the 1928 election, Hitler addressed rural constituencies more explicitly by revising the interpretation of the contentious *Point Seventeen* of the 1920 party program. While the original text rejected land ownership as private property and favored expropriation, Hitler now asserted that the provision had always targeted only land held by Jewish speculators (Stachura 1978). This reinterpretation reduced uncertainty among landowning voters about the party's stance toward private property and facilitated broader appeals in agrarian regions.

In practice, rural mobilization combined two pillars: propaganda that foregrounded concrete agrarian grievances and promised relief, and the co-optation of local opinion leaders and rural elites. Both became more systematic after 1928 and the ensuing wave of agrarian protest. Programmatically, the party presented an agricultural platform in March 1930, drafted by Walther Darré, emphasizing protectionist rhetoric, debt relief, and support for agricultural laborers—themes that became even more pronounced by 1932. Organizationally, Darré helped professionalize rural campaigning through agricultural advisors who monitored local conditions and tailored propaganda—including via local press outlets—to constituency-specific grievances (Gies 2019, pp. 571, 586). In parallel, the NSDAP sought institutional access by penetrating agrarian organizations, especially public agricultural chambers (*Landwirtschaftskammern*), where from 1931 onward it gained substantial representation and in some provinces even majorities (Gies 2019, pp. 605–607).[6]

[6] The opportunistic mix of locally tailored messaging and elite brokerage complicates attempts to capture mechanisms quantitatively. Infiltration of agrarian organizations is a case in point: in some settings the NSDAP ran explicit lists in chamber elections and publicized results in party-linked outlets, while in others existing chamber members were already sympathetic, reducing the need for visible organizational entry (Gies 2019).

This background motivates our empirical approach. By the end of the 1920s, German agriculture had accumulated a large stock of fixed nominal debt. When the Great Depression hit, falling agricultural prices and economy-wide deflation reduced nominal farm revenues while leaving nominal debt contracts largely unchanged. In parallel, the NSDAP's engagement with the rural electorate shifted from relatively ad hoc local campaigning to a more systematic strategy after 1928 and especially after 1930—creating, in other words, an organized political alternative capable of translating localized economic hardship into electoral mobilization. The remainder of the paper establishes the link between debt deflation and the radicalization of the rural vote quantitatively.

3 Data

Before describing the construction of the variables that underpin our empirical analysis—the local measure of the exposure to debt deflation (Section 3.1), electoral outcomes (Section 3.2), and control variables (Section 3.3)—it is necessary to define a common geographical unit that allows us to match these variables and to define the sample across these units, given our focus on the agricultural debt problem.

The smallest geographical unit that allows us to combine voting outcomes, agricultural output, and the debt data is the county (*Kreis*). We create time-consistent units at this level between 1925 and 1932. Given our focus on the countryside, we begin by dropping all counties with a below-median agricultural employment share (35.4%). Ideally, we would simply work with this sample. However, frequent administrative reforms and the recording of the debt data made this impractical. First, reforms moved municipalities from counties surrounding cities (*Landkreise*)[7] to their urban counterparts (*Stadtkreise*) of the same name. Additionally, administrative reforms moved municipalities between rural counties. We drop counties for which administrative reforms would require us to merge them with another county of below-median agricultural employment share, i.e., an urban county. We allow, however, the aggregation of counties with above-median agricultural employment share, should the administrative reforms require this. Here, we follow the approach established by King et al. (2008). Second, debt and tax data are reported at the level of tax offices. Their jurisdictions do not always align with county boundaries. For a small number of counties (17), this misalignment produces ambiguities so large that we exclude them from the analysis. Appendix B.1 documents this and all other decisions with respect to the geographical units. Our final dataset covers 268 counties that have an above-median agricultural workforce and are consistent over time.

[7] Despite their name, *Landkreise* were not necessarily rural. Many, such as Aachen, Chemnitz, or Düsseldorf, show agricultural employment shares well below 10% in 1925.

3.1 The local exposure to debt deflation

In line with the decomposition of the leverage ratio in Section 2.1, we develop a local exposure measure to debt deflation. In principle, one could use existing data on debt levels and income in 1928 and 1932 and simply calculate the change in their ratio between the two periods. However, three factors make this approach both undesirable and impractical. First, for 1932, neither data for debt levels nor agricultural income are available on the county level.[8] Second, following the logic of the debt deflation theory (Mason and Jayadev 2014), it would be preferable to have a measure that excludes primary deficits and is based on changes in the three Fisher variables (nominal interest rates, inflation, income). Third, using realized values for 1932 in both debt and income could introduce endogeneity concerns if access to credit or agricultural markets is related to local political outcomes.

To circumvent these concerns, we employ the debt-income ratio of 1928 as our pre-deflation baseline. For 1932, we construct *predicted* values based on initial characteristics and national-level changes. Our measure of local exposure to debt deflation in county i is defined as:

$$\Delta \widehat{Leverage\ ratio}_{i,1928-1932} = \frac{\widehat{D_{i,1932}}}{\widehat{Y_{i,1932}}} - \frac{D_{i,1928}}{Y_{i,1928}}. \tag{1}$$

In the following, we introduce the approach to predicting both the numerator (debt) and the denominator (income).

Our main data source—statistics that were produced as part of the parliamentary inquiry into the agricultural debt question (Enquete Commission 1930)—provides the total nominal debt by county as of 1928 for farms larger than 5 hectares.[9] To construct the (mechanical) increase in debt until 1932, we compound a county's existing debt levels in 1928 with an effective nominal interest rate of 8%, consistent with the aggregate interest burden documented for the late 1920s (Bauer 1939). The resulting liability-side component is

$$\widehat{D_{i,1932}} = 1.08^4 \cdot D_{i,1928}, \tag{2}$$

so that cross-sectional variation in the predicted debt change is a transformation of the 1928 debt level. A desirable feature of this measure is that it is immune to varying local credit conditions between 1928 and 1932 that could introduce endogeneity.

For the same set of farms as above, the Enquete Commission (1930) also provides wealth estimates W for the year 1928 on the county level. These were derived by capitalizing past average net profits (Π) with the factor $\chi = 18$ (Statistisches Reichsamt 1930, p. 10), such that $W_{i,1928} = \Pi_i \cdot \chi$. The estimates for past average net profits for any given farm were made based on selected farms in the vicinity. A key advantage of this approach was

[8] Note that while income tax statistics were published for 1932, agriculture was largely exempt from the income tax as discussed in Section 2.1 and only actually taxed incomes are given in the published statistics.

[9] This corresponds to around 84%–94% depending on the precise definitions of agricultural land.

that it dampened the effects of individual harvest outcomes, e.g., due to weather shocks. The profits Π are similar but not identical to the income concept used in Section 2.1 as they deduct labor by the farm owner as a cost and add owner-occupied housing as income. To arrive at an income estimate $Y_{i,1928}$, we thus apply a fixed adjustment factor based on the survey of accounting books.[10]

To calculate predicted income in 1932, we start with the observation that income Y_t is defined as

$$Y_t = \sum_s p_{s,t} q_{s,t} - c_t, \tag{3}$$

where $p_{s,t}$ and $q_{s,t}$ are the price and quantity of commodity s, and c_t denotes costs for inputs. Keeping quantities and costs constant over the short horizon ($q_{s,0} = q_{s,1}$ and $c_0 = c_1$)—a reasonable approximation for this period, as input prices such as machinery and fertilizer remained relatively stable (Abraham 1981, p. 194)—and expressing the share of costs in sales in t_0 as $\zeta_0 \equiv \frac{c}{\sum_s p_{s,0} q_s}$, we can rewrite the percentage change in income between two points in time as

$$g^Y = \frac{1}{(1-\zeta_0)} \sum_s \frac{v_{s,0}}{V_0} g^p_s, \tag{4}$$

i.e., the change in farm income is the weighted average of national commodity price changes g^p_s, scaled by the inverse of $(1-\zeta_0)$. Since $\zeta_0 < 1$, this term amplifies commodity price changes, reflecting that the combination of relatively sticky input costs and falling output prices compresses profits. Technically, the weights are the initial sales shares $\frac{v_{s,0}}{V_0}$. In the implementation, we proxy sales weights with county crop-area and livestock shares for data availability reasons and set the cost parameter $\zeta_0 = 0.5$.[11] We then obtain predicted county-level farm income in 1932 as

$$\widehat{Y_{i,1932}} = (1 + g^Y_{i,1928\text{–}1932}) \cdot Y_{i,1928}. \tag{5}$$

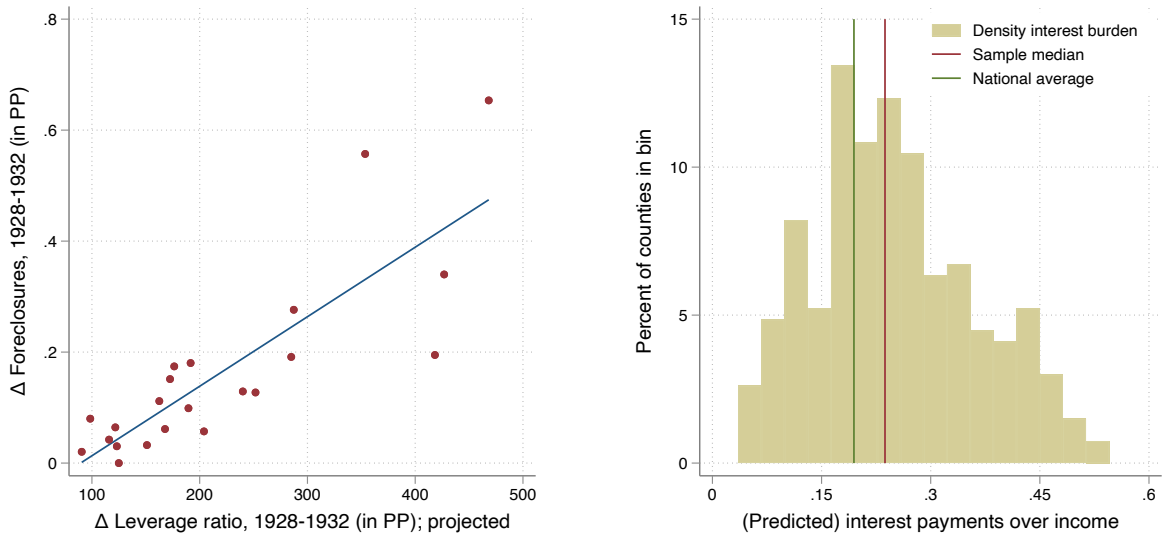
In the final step, we calculate the debt deflation exposure by subtracting the actual leverage ratio of 1928 from the leverage ratio in 1932 (equation 1). Appendix C.1 provides maps that highlight both its variation across the country and between counties within electoral districts.

To what extent does the measure capture economic hardship? Figure 2a shows that it has substantial predictive power for the worst economic outcome farmers faced during this period: foreclosure. The relationship between the debt deflation exposure, as measured by the predicted change in leverage, and the change in farm foreclosures is strongly positive,

[10] Naturally, since this adjustment is applied across the board, it has no effects on our econometric results except for rescaling the coefficients. We provide a discussion and a comparison with (independent) estimates from the income tax in Appendix B.3.

[11] The parameter value corresponds well to contemporaneous data (Bauer and Dehen 1938, p. 420). Appendix B.3 provides the full derivation and describes its implementation using our data.

Figure 2: Foreclosures and interest burden



(a) Debt deflation exposure and foreclosures (b) Interest burden as a share of income, 1932

Notes: Figure 2a shows our debt deflation measure between 1928 and 1932 and the change in the number of foreclosures over the same period as a share of the number of agricultural firms in 1928 (both in PP), on the level of Prussian provinces and states. Figure 2b shows the distribution of predicted interest burdens across counties. *Sources*: See Appendix A.

consistent with the idea that debt deflation translated into balance-sheet distress and forced liquidations. Since these forced sales are an outcome of last resort, this pattern likely understates the broader hardship experienced in highly exposed areas. Since the foreclosure data are only available at the province level, Figure 2b provides a granular view into the variation of economic hardship that debt deflation caused. It plots the distribution across counties of the predicted interest burden, defined as interest payments over income before interest payments in 1932. The red vertical line presents the sample median, and the green line the actual observed average in the national data from an external source. The proximity of both lines provides a validation for our measure, but more importantly, the graph highlights the magnitude of interest burden carried by farmers. In more than 25% of the sample, the average interest burden in terms of income was more than 30%. We present further validation of our measure in Appendix B.4.

3.2 Political outcomes

Our main political outcome is the change in the NSDAP vote share at the county level between the May 1928 election and the July 1932 election. We also examine party-by-party vote changes to characterize substitution patterns, in particular changes in support for agrarian and conservative parties and for the Communist party, as well as turnout. For this purpose, we follow Spenkuch and Tillmann (2018) and use votes as the share of

eligible voters. Electoral data are measured consistently at the county level; our main source for the election results is the standard data set by Falter and Hänisch (1990), to which we add the results for the smaller parties from Statistisches Reichsamt (1933a). Appendix A.3 provides the corresponding details, and Appendix Figure C.1 maps the spatial distribution of the change in electoral support for the NSDAP in our sample.

3.3 Other controls and distress outcomes

For standard socio-economic controls based on the 1925 census, we use Falter and Hänisch (1990) to which we add information from the agricultural census of the same year to determine crop shares and livestock holdings. In the voting analysis, we additionally control for the broader local downturn (proxied by revenues based on harvest statistics and unemployment rates) and for policy-induced factors (proxied by exposure to the *Osthilfe* aid program and the austerity measure in Galofré-Vilà et al. 2021). Appendix A provides a complete overview of variables and sources.

4 Debt deflation and voting

Did rural debt deflation contribute to the electoral rise of the NSDAP? This section provides the main evidence. We relate county-level changes in voting outcomes between 1928 and 1932 to our measure of exposure to debt deflation, constructed from predetermined pre-crisis agricultural debt positions and differential exposure to agricultural price deflation. Section 4.1 presents the baseline relationship between debt deflation and shifts in party support, emphasizing substitution away from agrarian and conservative parties toward the NSDAP. Section 4.2 then accounts for alternative channels and potential confounders. Finally, Section 4.3 considers the electoral consequences of agricultural debt deflation beyond the rural sample.

4.1 Baseline effects on electoral outcomes

Empirical approach What were the electoral consequences of debt deflation? We confront this question by estimating the following first difference specification:

$$\Delta \, Vote \; share_{i,1928-1932} = \alpha + \beta_1 \Delta \widehat{Leverage \; ratio}_{i,1928-1932} + \sum \beta X_{i,t} + \epsilon_i. \qquad (6)$$

where $\Delta \, Vote \; share_{i,1928-1932}$ is the change in votes as the share of eligible voters for either the NSDAP or a group of parties that we call farmers' parties, as they catered predominantly to farmers. To gain a complete picture of the effect of debt deflation on electoral movements, we also consider the often so-called Weimar coalition (Social Democrats, Liberals, and the Catholic *Zentrum*), the Communist party, a residual category, and turnout. $\Delta \widehat{Leverage \; ratio}_{i,1928-1932}$ is the change in the leverage ratio, i.e., our measure

of exposure to debt deflation. We include several initial-level control variables $X_{i,t}$, namely employment share in agriculture, the share of farm owners and their helping family members in agricultural employment, the share of Protestants in the population (all measured in 1925), and the initial support (in levels) of the relevant party or party grouping to capture their varying effects over time.

Some of the farmers' parties ran across Germany, such as the DNVP, while others were regional, such as the *Bayerischer Bauernbund* in Bavaria, or local, such as the *Bauern- und Weingärtnerbund* which only ran in the constituency of Württemberg. Note also that party candidate lists were generally created at the constituency level. Hence, we follow Spenkuch and Tillmann (2018) and include those constituencies (electoral districts; 35 in total) to account for potentially differing party landscapes across constituencies in our preferred specification. In a first-difference model like ours, these fixed effects represent constituency-specific time trends. In addition, we show the results using alternative regional time trends by including province or state fixed effects. We cluster standard errors at the administrative district level (72 in total; in German *Regierungsbezirk*).[12]

Identification relies on within-constituency variation in counties' predicted change in the leverage ratio between 1928 and 1932. In our first-difference specification, constituency-specific time trends absorb shocks common to all counties in the same electoral district over this period. Conditional on these trends and our baseline controls, the remaining variation comes from pre-crisis county characteristics: higher initial debt raises predicted debt burdens, while differences in initial agricultural composition and profits translate common national-level commodity price declines into differential predicted income losses. Any remaining omitted variable would therefore have to vary across counties within the same constituency and be systematically correlated with both electoral change and our measure of predicted debt deflation. We discuss in Section 4.2 to what extent this identifying variation may still capture other crisis-related shocks.

Political consequences Tables 1 and 2 report the corresponding results. We begin with the effect of the debt-income ratio on support for the NSDAP in Table 1. The Nazi party gained substantially more support in counties that were more severely affected by debt deflation. Column 1 presents the unconditional relationship and shows that the debt-income ratio explains 13% of the variation. The coefficient becomes smaller once controls are added (column 2) and different time trends are included (columns 3 to 5). The coefficient of interest in our preferred specification in column 3 implies that a 100 percentage point increase in the leverage ratio leads to a 2.0 percentage point increase in the NSDAP vote share. In substantive terms, a one-standard-deviation (SD) increase in the leverage ratio explains 20.4% of one SD in the change in NSDAP vote shares,

[12] We assign the areas for specific crops based on district-level data and errors are, thus, bound to be correlated at this level. See Appendix B.2 for details.

corresponding to 2.9 percentage points.

Table 1: Effect of leverage ratio on political support

Dep. var.	Δ NSDAP Vote Share, 1928–32				
	(1)	(2)	(3)	(4)	(5)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	0.035***	0.013***	0.020***	0.018***	0.011***
	(0.007)	(0.004)	(0.005)	(0.006)	(0.004)
Mean dep. var.	30.89	30.89	30.89	30.89	30.89
SD dep. var.	14.37	14.37	14.37	14.37	14.37
Controls		✓	✓	✓	✓
Constituency time trend			✓		
Province time trend				✓	
State time trend					✓
R-squared	0.13	0.77	0.88	0.87	0.83
Observations	268	268	268	268	268

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of Protestants, share of self-employed and family members in agricultural employment, and initial vote share. Sample is restricted to above median agricultural employment share.

The flip side of the NSDAP's gains were the losses of the farmers' parties shown in column 1 of Table 2. While the coefficient is roughly half the size of the one for the Nazi party, in terms of the effect size, they are more comparable: 1 SD in the debt deflation explains 16.2% of 1 SD in the loss of the farmers' parties. While we cannot exclude an ecological fallacy definitively, the fact that the coefficient is insignificant for the parties of the Weimar coalition, the Communists, the residual category, and for turnout supports the interpretation that the rural electorate supporting the NSDAP for economic reasons had previously given its votes to the conservatives or local protest parties. We therefore conjecture that the NSDAP successfully presented itself as the last viable option, since the farmers' parties, like the conservative DNVP, were not able to improve the economic situation of their traditional constituency. The null result (and even negative sign) for the Communist party indicates that rural radicalization in response to economic hardship due to debt deflation was not symmetric between left and right. As historical research has shown (Falter 1991), the economic program of the KPD was almost exclusively focused on industrial blue-collar workers and not attractive for farmers, who often owned their own land.

Robustness We subject our baseline results to four sets of robustness checks: stability across elections, pre-trend validation, outlier sensitivity and compositional stability, and spatial dependence.

We show that our results hold independently of which of the three general elections between July 1932 and March 1933 is used (Appendix Table C.1). The same table also

Table 2: Effect of leverage ratio on political support of other parties and turnout

Dep. var.	Δ Vote Share, 1928-32				
	Farmers'	Weimar	KPD	Other	Turnout
	(1)	(2)	(3)	(4)	(5)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	-0.009**	-0.004	-0.001	-0.002	0.004
	(0.003)	(0.004)	(0.002)	(0.001)	(0.004)
Mean dependent variable	-15.81	-2.53	3.06	-6.87	8.74
SD dependent variable	8.32	5.65	2.00	4.82	7.03
Controls	✓	✓	✓	✓	✓
Constituency time trend	✓	✓	✓	✓	✓
R-squared	0.91	0.67	0.34	0.95	0.76
Observations	268	268	268	268	268

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of Protestants, share of self-employed and family members in agricultural employment, and initial vote share. Sample is restricted to above median agricultural employment share.

shows that there is no significant effect of debt deflation on the NSDAP vote for the September 1930 election. This reinforces our results in that the impossibility of refinancing following the 1931 banking crisis transformed the looming threat of debt deflation exposure into a concrete disaster for the rural economy.

A natural concern in our first-difference specification is the comparability of units more and less exposed to debt deflation. Could our exposure measure simply capture varying trends between the two groups? Given the small number of pre-Depression era elections and the fact that the Nazi party did not compete in a nationwide election before 1928—it did not run in 1920 and was banned from participation in 1924—we are limited in formal pre-trend analyses. Instead, we conduct placebo exercises by regressing changing vote shares of NSDAP proxy parties on our exposure measure.[13] As Appendix Table C.2 shows, our debt deflation measure does not have any explanatory power for changes in far-right vote shares before the Great Depression.

The results are not driven by any single constituency or province, as the leave-one-out exercise confirms (Appendix Figure C.3). Nor are they confounded by selective migration: debt deflation exposure did not trigger population movements that would alter the composition of counties, a null result consistent with the scarcity of urban employment opportunities during the Depression (Appendix Table C.3).

Spatial dependence is a natural concern in our setting. We therefore report Conley standard errors in Appendix Table C.4. As an additional robustness check, we also consider the spatial unit-root framework of Becker, Boll, and Voth (2026) and report

[13] In 1920, there was no comparable party. In May 1924, the proxy is the *Deutsch-völkische Freiheitspartei*; in December 1924, it is the *Nationalsozialistische Freiheitsbewegung*. Both ran in cooperation with Nazi party leadership (Falter 1991).

residual-based tests both in levels and in first differences:[14] Spatial stationarity cannot be rejected in both cases (p-values: 0.8778 and 0.8788 for levels and changes, respectively), while the unit-root test is rejected at the 1%-level (p-values: 0.0021 and 0.0024 for levels and changes, respectively). Overall, these results provide little evidence that residual spatial dependence is driving our findings.

4.2 Accounting for alternative channels

The baseline results show that counties more exposed to debt deflation experienced larger NSDAP gains and larger losses among agrarian and conservative parties. To interpret these patterns as evidence for a debt deflation channel, two important questions need to be addressed: First, could other Depression-era forces, such as general economic decline, targeted agricultural interventions, or austerity-related hardship, taint the results? Second, could non-economic drivers of Nazi support be related to the proposed debt deflation channel?

Alternative economic crisis channels A key question is whether our results reflect debt deflation per se or a shock correlated with the exposure to debt deflation ($\Delta \widehat{Leverage\ ratio}_{i,1928\text{–}1932}$). Farm and rural incomes are of primary concern because the farmers' income features the leverage ratio in the denominator. We address this concern in two ways. First, we decompose the leverage ratio into its debt and income parts. Second, we elicit the degree to which the inclusion of correlates of rural income shortfalls (crop revenues, unemployment, austerity, and a government subsidy) affects the stability of the debt deflation coefficient.

To include both components of the leverage ratio separately in our main specification (equation 6), a small adjustment is necessary. The nominal debt level chiefly depends on the number of farmers in a county. Since county sizes vary substantially, we normalize the initial debt level as of 1928 by population and log-transform the resulting variable. To capture the decreasing income, we include our measure $g^{Y}_{i,1928\text{–}1932}$, which we use to predict the decline in farm incomes due to the fall in prices (Section 3). Appendix Table C.5 reports the results using standardized coefficients to ease the comparisons. Both estimated coefficients are statistically significant and show the expected signs: higher initial debt and larger income losses are associated with higher NSDAP support. Crucially, the standardized coefficient for initial debt is almost twice as large as that of income. This confirms that the income component of our measure is not the sole driver of the results.

As a second test, we confront the stability of the debt deflation coefficient when including a number of indicators correlated with rural incomes (Table 3). The first

[14] Their `spurtest` procedure is designed for variables in levels, or for residuals from levels regressions, whereas our baseline specification is estimated in first differences over time. We therefore do not view a mechanical application of their test to our main specification as exact. For details, see Appendix C.2.2.

variable is closest to farm incomes, but only pertains to a subset of the data. While actual income data are not available for the years 1932 and 1933, we calculate crop revenue as the product of harvest quantities (based on Prussian harvest statistics) and national prices, assuming that all products were sold at nationally integrated market prices.[15] Again, as counties are of different sizes, we normalize revenue by population and calculate its change between 1928 and 1932, which is negative for all rural counties. Column 2 of Table 3 shows the results. While declining revenues themselves contributed to rising NSDAP vote shares, they do not cancel out the effect of the interaction between debt and income as captured in our debt deflation measure.

Debt deflation captures economic hardship for the self-employed, in our case, owner-operated farms. It may also, however, be related to another main feature of the Great Depression—rising unemployment—especially if farm foreclosures led to joblessness among agricultural laborers. We therefore include unemployment explicitly in our estimation. Unfortunately, county-level data are only available through the 1933 census, and thus, we cannot calculate a change.[16] The results are shown in column 3 of Table 3. As previous empirical work has shown, higher unemployment is negatively related to Nazi party vote shares. The unemployment statistics mainly capture blue-collar workers and their protest vote tended to benefit the Communists. The unemployment variable remains insignificant in our estimation and including it, if anything, increases the magnitude of our coefficient of interest.

Columns 4 and 5 turn the focus to policy measures that plausibly affected rural incomes. The first test is whether the actual policy intervention of debt relief (*Osthilfe*) affects our results. To account for its potential effect, either through amelioration of the farmers' economic situation or through frustration with the program's ineffectiveness, we include a dummy variable indicating whether a particular county was part of the program and its farmers thus eligible for aid.[17] The dummy, as included in column 4 of Table 3 is negative, but insignificant. Including it leaves our results unchanged.[18] To test for the role of austerity-related policies in our setting, we reconstruct the measure used in Galofré-Vilà et al. (2021) and calculate the change in the tax rate between 1928 and 1932

[15] Brey and Facchini (2024) exploit *local* variation in agricultural product prices. Note, however, that this variation stems mainly from perishable products, such as eggs and milk. There is no variation for grains and meat (Brey and Facchini 2024, p. 21)—the product categories we mainly rely on in this analysis. To the extent that the authors identify an income effect, we offer an additional mechanism through which it may have affected voting outcomes, namely, debt deflation.

[16] Other works, such as Galofré-Vilà et al. (2021), have used state-level unemployment rates instead. Maintaining variation at the county-level at the cost of including a post-period control strikes us as the better choice here.

[17] County-level data on actual spending are, unfortunately, not available. Debt relief and foreclosure moratoriums applied to firms located in 58 counties across five provinces in our sample after August 1930 as specified in von Hindenburg (1930).

[18] Appendix Table C.6 further accounts for factors impacting policy implementation. All results remain robust.

Table 3: Other crisis channels

Dep. var.	Δ NSDAP, 1928-32					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ$\widehat{Leverage\ ratio}$, 1928-1932	0.020***	0.017***	0.021***	0.020***	0.020***	0.019***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Δ*Revenue pc*, 1928-1932		-0.018**				-0.017**
		(0.006)				(0.007)
Unemployment (%), 1933			-0.752			-0.728
			(0.476)			(0.470)
Osthilfe, dummy				-0.444		-0.852
				(1.733)		(1.825)
Δ*Tax rate*, 1928-1932					-0.007	-0.074
					(0.267)	(0.349)
Mean dependent variable	30.89	37.84	30.89	30.89	31.27	37.95
SD dependent variable	14.37	11.79	14.37	14.37	14.48	11.76
Controls	✓	✓	✓	✓	✓	✓
Constituency time trend	✓	✓	✓	✓	✓	✓
R-squared	0.88	0.87	0.88	0.88	0.88	0.87
Observations	268	143	268	268	255	142

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of Protestants, share of self-employed and family members in agricultural employment, and initial vote share. Sample is restricted to above median agricultural employment share. Column 2 is restricted to Prussia due to data availability. Column 5 contains 13 missing observations due to non-reporting tax offices. Column 6 combines both restrictions.

based on county-level income tax statistics.[19] Including the measure in column 5 of Table 3 leaves our estimated coefficient unchanged.

Finally, we combine all potential crisis-related explanations of Nazi success described above in one estimation, shown in column 6 of Table 3. The coefficient of debt deflation remains highly significant and only marginally decreases compared to the baseline estimate. These results chime with the first exercise: Income shocks do not appear to be the main driver underlying our findings.

Non-economic explanations So far, we have focused on purely economic factors for the rise of the Nazi party. We next ask whether additional societal and cultural factors help explain electoral changes in our first-difference setting. To do so, we augment our baseline specification with drivers emphasized in previous research that could plausibly matter in our rural context: the consequences of World War I, both in terms of casualties (De Juan et al. 2023) and veterans (Koenig 2023), the role of religious elites (Spenkuch and Tillmann 2018), and persistent anti-Semitism (Voigtländer and Voth 2012).[20] This is not intended as a general test of these explanations; rather, we examine whether they have additional explanatory power for changes in voting in our specification and whether they affect the estimated coefficient on debt deflation. The results, reported in Appendix Table C.7, show that none of these non-economic factors has additional explanatory power in our setting, while the coefficient of debt deflation remains largely unchanged.

4.3 National-level effect of agricultural debt crisis

To gauge the total effect of debt accumulation and deflation on voting, we construct a hypothetical scenario without the debt accumulation and deflation crisis. For this scenario, let us first assume that, rather than taking up substantial debt to refinance old debt, the government had stabilized incomes and farmers had taken up debt only for investment purposes. The parliamentary inquiry found that this was only the case for 21% of the total debt uptake until 1928 (Enquete Commission 1930, p. 91). This still implies a significant debt uptake between 1923 and 1928, corresponding to a leverage ratio of 40.5% using the sector's income as the denominator. Analogously to our estimates in Section 3.1, we project this reduced debt stock forward, assuming again an interest rate of 8%. This results in a lower numerator of the leverage ratio for each rural county compared to the actual one. Second, we conjecture that commodity prices had not fallen, for example, because Germany left the gold standard. In consequence, farm incomes (in the denominator) would have remained constant. The formal description of the counterfactual

[19] Note, here, that as previously discussed, agricultural income is not included in the published 1932 statistics. Calculating the tax rate as tax revenue over recorded income, thus, overestimates the tax rate increase in areas more heavily reliant on agriculture.

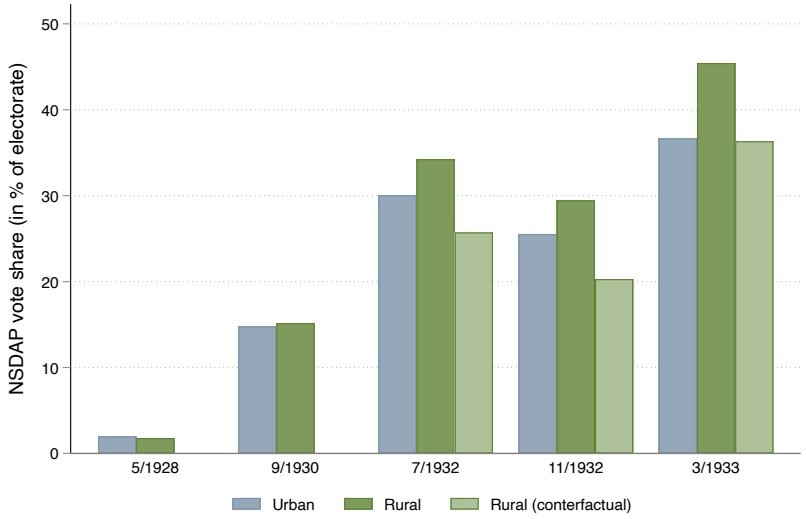
[20] For details on the implementation, see Appendix C.4.

is denoted as:

$$\widehat{Leverage\ ratio^{cf}}_{i,1932} = \frac{\mathbf{0.21} \cdot D^{\text{New}}_{i,1928} \cdot (1.08^4)}{Y_{i,\mathbf{1928}}}. \tag{7}$$

Taken together, our two assumptions yield a hypothetical leverage ratio in 1932 which is lower than our projected 1932 values used in the analysis above. Multiplying this difference by our preferred estimate shown in Table 1, column 3, suggests a decline in the average vote share for the NSDAP by 8.5 percentage points in July 1932 and even slightly larger declines in the two subsequent elections.

Figure 3: Aggregated effects of rural debt deflation on voting



Notes: Figure 3 shows the NSDAP vote share in urban and rural areas as well as the counterfactual vote share for the NSDAP without debt deflation. Urban counties are defined by a median sample split (below an agricultural employment share of 35.4%). Rural counties are those 268 included in our estimation, i.e., with above median agricultural employment share, which do not contain urban areas due to aggregation. *Sources*: Actual election data from Falter and Hänisch (1990). For the calculation of the counterfactual voting outcomes, see text.

Figure 3 illustrates the magnitude of this hypothetical change. It shows the Nazi party's vote share in the electorate for all national parliamentary elections in which it was able to participate legally, separated by voters in urban and rural counties.[21] In the earlier elections, the party achieved slightly stronger or equal results in the urban parts of Weimar Germany, both in 1928 as a splinter party hovering around 2% of the vote and in 1930, when the NSDAP celebrated its first real success on the national stage. By July 1932, however, the situation was reversed, and the National Socialists received significantly more support in rural counties by a margin of multiple percentage points in the subsequent two elections. Yet, in our counterfactual situation in which farmers and rural communities were much less exposed to debt deflation and its harmful consequences,

[21] We apply the same definition of an urban county as in the rest of the analysis, i.e., one with below median (35.4%) agricultural employment share. The rural sample includes only observations used in our analysis.

the rural NSDAP vote share would have remained below its urban counterpart in all elections.

To underscore the relevance of debt deflation for actual parliamentary representation and power, we need to translate the hypothetical rural vote share into national-level election outcomes. We proceed as follows: We (1) subtract the counterfactual decline in percentage points from the NSDAP's vote share in those rural counties contained in our sample, (2) convert the resulting rural vote share to absolute votes, and (3) calculate a new national-level vote share for the NSDAP by adding the results for the out-of-sample counties. Note that our calculation implies *no* changes in counties with an agricultural employment share below 35.4% or any counties that drop out of our analysis due to aggregation—a very conservative assumption.[22] This exercise yields a hypothetical NSDAP vote share of 35.5% in July 1932, a decline of roughly 1.6 percentage points. This decline would have been sufficient to allow other parties to form a majority coalition against the NSDAP and the Communist party.

As for any counterfactual, the relevance of this calculation hinges on the validity of the underlying assumptions. On the one hand, the counterfactual assumes the displaced votes would have benefited parties willing to form a majority coalition against the NSDAP. One may object that the main protestant conservative party (DNVP) became increasingly skeptical of parliamentary cooperation with Weimar-supporting parties (Mergel 2003). The counterfactual is therefore best read as opening the arithmetic possibility of an anti-NSDAP majority, not as a guarantee that one would have formed. On the other hand, our counterfactual understates the effects of debt deflation along two dimensions. First, it ignores the effect of agrarian debt deflation in counties not included in our sample. Second, debt deflation presumably also radicalized over-leveraged households and businesses outside of agriculture. Our estimate is therefore a lower bound on the political relevance of debt deflation. On balance, we thus consider debt deflation as a plausibly necessary condition for the Nazi party's rise to power.

5 Conclusion

What are the political costs of deflation? This paper shows that debt deflation in rural Germany was an important contributor to the electoral rise of the NSDAP. German farmers entered the Great Depression with high nominal debts, and the subsequent fall in agricultural prices and incomes increased the real burden of these debts. Exploiting cross-county variation in pre-crisis agricultural debt exposure and differential exposure to agricultural price deflation, we find that counties experiencing larger debt deflation

[22] This procedure also accounts for the fact that the main analysis is conducted in votes per *eligible* voter, whereas the majority in parliament is determined by the share of *valid* votes. It further assumes the participation of would-be NSDAP voters to the benefit of other parties. This seems reasonable given our results in Table 1.

shocks shifted electoral support away from agrarian and conservative parties and toward the Nazis between 1928 and 1932.

Two features of the electoral response are particularly informative. First, the party-by-party patterns indicate substitution away from established right-wing and agrarian parties rather than an undifferentiated drift toward extremism: we find no comparable increase in Communist support in counties more exposed to debt deflation, consistent with historical accounts that Communist mobilization was primarily urban and industrial. Second, the estimated relationship survives controls for broader crisis severity and policy-induced hardship, suggesting that debt deflation captures a distinct mechanism beyond general economic decline.

More broadly, our results provide micro-level evidence for the crisis–radicalization link by pinning down debt deflation as one concrete mechanism through which large downturns can translate into anti-establishment voting. This matters because different crisis mechanisms imply different vulnerable groups and, potentially, different remedies: for understanding when downturns undermine democratic stability, it is important to distinguish debt deflation from other channels, such as unemployment or bank distress.

Future research should investigate the link between debt deflation and political radicalization beyond the specific case of the German agricultural sector along two dimensions. First, debt deflation also affected other parts of the economy, such as mortgage-holding households and over-leveraged business owners. This may help explain a pattern identified by King et al. (2008): the self-employed—like farmers, a group carrying fixed nominal debts against collapsing revenues and asset values—shifted disproportionately toward the Nazis, suggesting that debt deflation exposure may have been a broader driver of radicalization among indebted groups. Examining whether this mechanism shaped political behavior among these groups would help show whether the debt-deflation–radicalization nexus extended beyond agriculture. Second, extending the analysis to other countries and episodes could clarify how general the debt-deflation–radicalization nexus is.

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Online Appendix

A Data and sources

A.1 Leverage at the national level

Debt and effective interest

- Sources:
  - For the debt stock:

    End of year values are from Kokotkiewicz (1932, p. 21f)

    For 1924 from Enquete Commission (1930, p. 33)

    For 1932 from Bauer (1939, p. 56)
  - For the sum of interest payments:

    Kokotkiewicz (1932, p. 22) and Bauer (1939, p. 56)
- Description: The item 'other debts' is estimated for 1924, assuming a constant relationship to the sum of short, medium, and long-term debt. For 1932, no estimates for the structure exist and for ease of presentation, it is assumed to be constant. The effective nominal interest rate is defined as the interest paid over the debt stock in the previous period. For the decomposition, we approximate the effective interest rate as interest payments over previous period debt. For the year 1925, we make an adjustment as debtors started to pay interest on reinstated debt. We hence add the reinstated debt (2.75 billion RM) to the debt of 1924 when calculating the effective interest rate.

Farm incomes and real growth rate

- Source: Bauer and Dehen (1938), Wirtschaft und Statistik (1934, 1938), Fensch (1932), Statistisches Reichsamt (1935, 1938)
- Description: The debt data refer to the debt of self-employed German farmers. We thus aim to have an income concept that pertains to this group, i.e., it should exclude the incomes of agricultural laborers. We base our estimate on the work by Bauer and Dehen (1938), who estimate the income for the whole sector. From this, we deduct the income of the laborers from Statistisches Reichsamt (1935, 1938) and owner-occupied housing provided by Bauer and Dehen (1938). Our preferred estimates include own consumption (a substantial part of agricultural incomes, given the substantial share of small-scale farms). Our final estimate is consistent with the net value added estimates by Fremdling (2010), who focuses on production, not income.

- The real growth rate is calculated as the change in real incomes. We calculate real incomes (and the deflator) using the implicit GDP deflator. The implicit GDP deflator, in turn, is estimated by dividing nominal by real incomes in agriculture and forestry in the national accounts (Statistisches Reichsamt 1935, 1938).[1]

Inflation

- Source: Statistisches Reichsamt (1935, 1938)
- As our measure of inflation, we calculate changes in the implicit GDP deflator.

[1] Note that for 1924, there are no estimates for the real income. We use the 1924-1925 changes in the wholesale price index reported in Balderston (1982, p. 500) to extend the deflator backwards.

A.2 Agricultural sector

Agricultural debt, assets, and income

- Sources:
  - Enquete Commission (1930): debt of agricultural firms (over 5ha) in RM as of 01.01.1928 and corresponding tax values used to derive income
  - Statistisches Reichsamt (1930): tax values as of 01.01.1928 to validate debt deflation measure; sample deviates slightly from Enquete Commission (1930), see Appendix B.4 for details
  - Deutsche Rentenbank-Kreditanstalt (1929): reinstated debt by farm size in 1928 for new debt uptake used in counterfactual
  - Deutsche Rentenbank-Kreditanstalt (1932): regional debt in 1931 to validate debt deflation measure
  - Statistisches Reichsamt (1939): tax values as of 01.01.1931 to validate debt deflation measure
- Units:
  - Enquete Commission (1930): tax office
  - Statistisches Reichsamt (1930): county
  - Deutsche Rentenbank-Kreditanstalt (1929, 1932): seven regions (Eastern Prussia, Silesia, Northern Germany, Northwestern Germany, Central Germany, Southwestern Germany, Bavaria)
  - Statistisches Reichsamt (1939): county
- Years: 1928, 1931

Agricultural census

- Sources: Statistisches Reichsamt (1928, 1929)
- Statistisches Reichsamt (1928) for cultivation areas by crop, Statistisches Reichsamt (1929) for livestock holdings and plowland by farm size category (see Appendix B.2 for details)
- Units:
  - Statistisches Reichsamt (1928): administrative district (*Regierungsbezirk*)
  - Statistisches Reichsamt (1929): county
- Year: 1925

Agricultural prices

- Sources: Statistisches Reichsamt (1933b) and Hanau and Plate (1975)
- Yearly price data for agricultural products
- Unit: national
- Years: 1928–1932

Harvests

- Sources: Preußisches Statistisches Landesamt (1929, 1933)
- Harvests by crop for Prussia
- Unit: county
- Years: 1928, 1932

Foreclosures of agricultural firms

- Sources: Kokotkiewicz (1932)
- Number and area of foreclosure auctions of farms
- Unit: national-level (p. 14) and province-level (pp. 46f)
- Years: 1924–1932

Harmonization Product categories and prices

Table A.1: Product harmonization

Agricultural Census 1925	**German market prices**	**Harvest data**	**Translation**
Roggen (5)	Roggen	Winterroggen Sommerroggen	Rye
Weizen, Spelz, Emer, Einkorn (4)	Weizen	Winterweizen Sommerweizen	Wheat
Gerste (7)	Gerste	Wintergerste Sommergerste	Barley
Hafer (8)	Hafer	Hafer	Oats
Erbsen, Bohnen, Linsen in feldmäßigem Anbau (13)	Bohnen Erbsen	Speisebohnen Erbsen	Beans Peas
Kartoffeln (16)	Kartoffeln	Frühkartoffeln Spätkartoffeln	Potatoes
Zuckerrüben (17)	Zuckerrüben	Zuckerrüben	Sugar beets
Futterrüben, Runkelrüben, Möhren, Hackfrüchte (18)	Mohrrüben Kohlrüben	Mohrrüben Kohlrüben	Carrots Rutabaga
Futterpflanzen (Klee und Gras aller Art) (25)	Heu	Klee	Hay
Rindvieh (11)	Rindvieh		Cattle
Schafe (12)	Schafe		Sheep
Schweine (13)	Schweine		Pigs

Notes: Sources in order; for the agricultural census: Statistisches Reichsamt (1928, 1929), for the German price data: Statistisches Reichsamt (1933b) and Hanau and Plate (1975), and for Prussian harvest data: Preußisches Statistisches Landesamt (1929, 1933).

A.3 Election results

Reichstag elections

- Sources: Falter and Hänisch (1990), Statistisches Reichsamt (1933a)
- Unit: county, i.e., aggregation levels 4, 5, and 6 in Falter and Hänisch (1990)
- Years: 1928-1933
- Eligible (after 1920): In Weimar Germany, an eligible voter was every German citizen over 20 years of age. The only exceptions were active soldiers (of which there were only 100,000 per the Treaty of Versailles) and people who had been criminally convicted and sentenced to loss of honor rights (*Ehrenrechte*) or declared legally incapable (Reichsministerium des Inneren 1924, p. 129).
- Parties summed up in "farmers' parties":
  - *Deutschnationale Volkspartei* (DNVP)
  - *Christnationale Bauern- und Landvolkpartei*
  - *Deutsche Bauernpartei*
  - *Bayerischer Bauernbund*
  - *Bauern- und Weingärtnerbund*
  - Note that the smaller parties were only regionally active, i.e., had different leadership, organization, and even names depending on the constituency (e.g., the *Deutsche Bauernpartei* was the *Bayerischer Bauernbund* in Bavaria, and the *Bauern- und Weingärtnerbund* only ran in the constituency of Württemberg). For this reason, including constituency-specific time trends are particularly important here. Additionally, the *Christnationale Bauern- und Landvolkpartei* had a vote-sharing agreement with the DNVP, which is why they should not be regarded separately. The electoral system of Weimar Germany assigned one seat in parliament for every 60,000 votes. These were distributed first at the level of constituencies (*Wahlkreise*). If a party had a number of votes left over that would not garner it a whole seat, these votes would be added up on a higher level (*Wahlkreisverbund*) with left-over votes from other constituencies. On this level, e.g., the *Christnationale Bauern- und Landvolkpartei* gave its votes to the DNVP.

A.4 Population

Population census

- Source: Falter and Hänisch (1990)
- Unit: county, i.e., aggregation levels 4, 5, and 6 in Falter and Hänisch (1990)
- Years: 1925
- Population; employment in agriculture; self-employed and helping family members in agriculture; Protestants

B Data construction

B.1 Aggregation and sample definition

The construction of time-consistent units of observation is a central concern in any panel analysis of aggregated data and is particularly challenging in the historical context. For this paper, two different types of units (counties and tax office districts) needed to be made consistently comparable between 1925 and 1932, a period that comprises multiple administrative reforms that changed observation boundaries and thus necessitate aggregation. For this purpose, we proceed in the following way:

1. The agricultural census of 1925 (Statistisches Reichsamt 1929) is related to the shapefile for 1925 provided by the Max Planck Institute for Demographic Research and Chair for Geodesy and Geoinformatics, University of Rostock (2011) by county names.

2. Name changes are tracked over time and relevant observations linked, in particular, to accommodate election data from 1925 to 1932 and fit them to the census data.

3. Administrative reforms that result in boundary changes are identified using Hubatsch and Klein (1978) and the relevant observations are aggregated.[2]

Unfortunately, many such reforms just shifted municipalities from one county to another. As municipality-level data is not available, this results in a trade-off between perfect consistency over time and the number of observations available for the analysis. Handily, Falter and Hänisch (1990) contains information on a county's population according to the last census (1925) at every election. Changes in this population number are thus merely the result of administrative boundary changes, not of migration or demographic changes. In using this information, we follow King et al. (2008) and accept a change in population of up to 10% between two consecutive elections. As we start our analysis already in the mid-1920s, these steps result in a lower number of observations (636) than other studies that only start their analyses in 1928 or later.

Another consideration specific to our setting is the focus on the agricultural economy, i.e., rural areas. To avoid noise stemming from urban areas, we exclude all observations with a below median agricultural employment share (35.4%). The median is calculated based on the complete set of counties included in the 1925 agricultural census (1052), which are matched to *Kreise* as given in Falter and Hänisch (1990) to calculate the share based on the employment census. Additionally, going forward, we exclude all aggregated observations that include at least one such, by our definition, urban area. Overall, we drop 151 unaggregated urban areas and 192 units that contain at least one urban area.

[2] We are grateful to Alexander Wulfers, who provided this step based on his dissertation, which we expand upon to include tax offices and the 1920 election.

Given our use of debt and asset data, we further have to account for tax offices. Here, we proceed similarly to the procedure described above. First, wherever possible, we relate tax offices to counties by name and check whether the office is indeed responsible for all of the county, relying on Rademacher (2008).[3] If a tax office cannot be matched to a county by name, this can have two possible reasons, which we identify, again relying on Rademacher (2008). First, if the purview of one tax office contains multiple counties, we aggregate those counties. Note, however, that these aggregations coincide with those made due to shifting municipalities outlined above and do not further decrease our number of observations. Note further that, again, the observation only remains in the sample used for analysis if the aggregated units do not contain any areas identified as urban based on the 1925 employment census. Second, if two or more tax offices are responsible for different parts of the same county, we cannot distinguish between rural and urban areas. We, therefore, drop these observations from the analysis. This is the case for 17 observations.

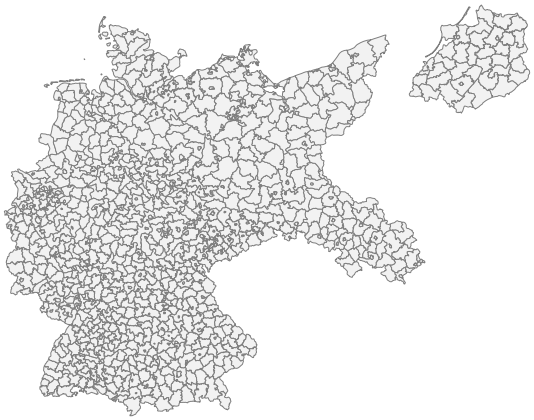
Finally, to ensure a consistent number of observations between alternative specifications, specifically alternative fixed effects (constituencies, provinces, states), we drop those units that are excluded from the regression as singletons based on any of these fixed effects. The numbers are 5 for constituencies and 2 for provinces. State fixed effects introduce no additional singletons.

Appendix Figure B.1 documents the data aggregation. Appendix Figure B.1a shows the county-level shapefile provided by Max Planck Institute for Demographic Research and Chair for Geodesy and Geoinformatics, University of Rostock (2011), while Appendix Figure B.1b shows the aggregated observations at the end of the procedure described above. Boundary changes in the north and, particularly, in the region around Silesia in the east necessitated a lot of aggregation. Appendix Figure B.1c further shows counties with above median employment share in agriculture and no issues due to aggregation as outlined above—which make up the basis of our main analysis—and indicates the boundaries of the 35 constituencies (*Wahlkreise*) in which parties presented candidate lists to their voters and which we include as fixed effects in the analysis. As can be seen in the map, there are five constituencies that only contain one rural county (Düsseldorf-West, Köln-Aachen, Liegnitz, Potsdam II, and Thüringen), which are dropped from the analysis as singletons containing no additional information and potentially overstating significance (Correia 2015). Figure B.1d again shows the rural sample, but in relation to the boundaries of the 72 districts (*Regierungsbezirke*) on the level of which the 1925 agricultural census contains the cultivation areas of specific crops, which we distribute to the county level (see Appendix B.2). Due to this interpolation, we also cluster standard errors on the district

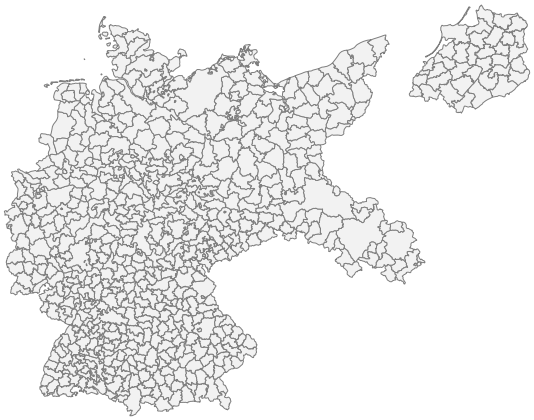
[3] This website was originally created by the historian Michael Rademacher and proved an invaluable resource. For each German tax office that existed in 1927, it includes a list of municipalities in its purview, information on other administrative boundaries that intersect with or surround it, as well as lists of the relevant official sources.

level in the main analysis.

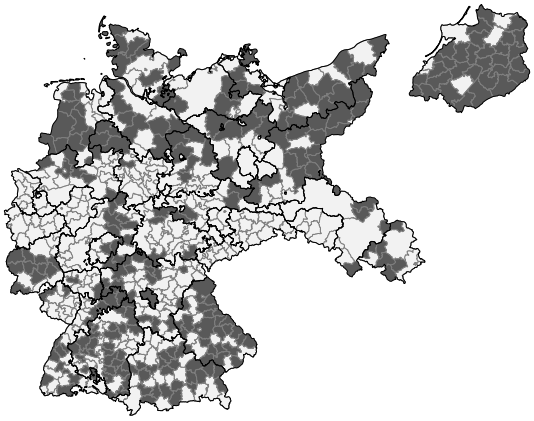
Figure B.1: Data overview



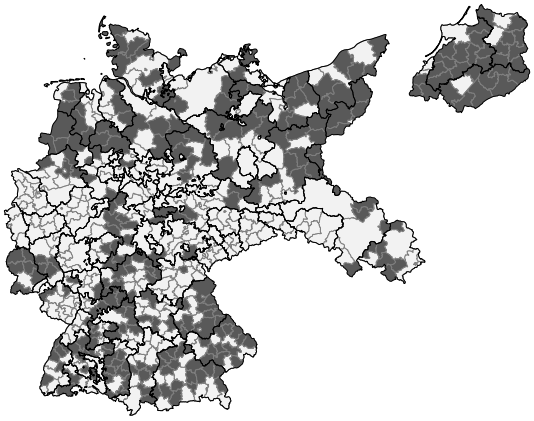
(a) MPIDR map of counties, 1925



(b) Aggregated counties, 1924–1933



(c) Rural sample and constituencies



(d) Rural sample and districts

Notes: Panel (a) shows the county map (*Kreise*) of the German Empire in 1925 provided by Max Planck Institute for Demographic Research and Chair for Geodesy and Geoinformatics, University of Rostock (2011). Panel (b) documents the aggregation used to construct time-consistent units for 1925–1932 ($n = 636$). Panel (c) shows the rural sample ($n = 268$, dark gray) and the borders of the 35 constituencies (black). Panel (d) shows the rural sample (dark gray) and the borders of the 72 districts (black).

B.2 Combining county and district-level data

Our main source regarding county-level cultivation area by crop is the agricultural census of 1925, published in two volumes (Statistisches Reichsamt 1928, 1929). Statistisches Reichsamt (1928) contains district-level data on the cultivation area by crop and farm size category. Statistisches Reichsamt (1929) contains county-level data on the plowland by farm size category. Assuming each crop's s share of plowland within a given farm size k to be constant across counties i within a district d, we calculate

$$Area_{d,i,s,1925} = \sum_{k} \frac{Area_{d,s,k,1925}}{Area_{d,k,1925}} \times Area_{i,k,1925}$$

Farm size categories used by Statistisches Reichsamt (1928, 1929) in Ar ($10m \times 10m$) and Ha ($100m \times 100m$) are smaller than 50 Ar, 50 Ar to 2 Ha, 2 Ha to 5 Ha, 5 Ha to 10 Ha, 10 Ha to 20 Ha, 20 Ha to 50 Ha, 50 Ha to 100 Ha, 100 Ha to 200 Ha, 200 Ha to 500 Ha, 500 Ha to 1000 Ha, larger 1000 Ha. We exclude farms smaller than 5 Ha from the analysis because they produce for subsistence and, hence, are likely not affected by international competition. In addition, the debt data is only available for farms larger than 5 Ha.

B.3 Measuring debt deflation, 1928–1932

As pointed out in Section 3, we capture debt deflation as the change in the leverage ratios between 1928 and 1932:

$$\Delta \widehat{Leverage\ ratio}_{i,1928-1932} = \frac{\widehat{D_{i,1932}}}{\widehat{Y_{i,1932}}} - \frac{D_{i,1928}}{Y_{i,1928}}.$$

For 1928, Enquete Commission (1930) provides direct data on $D_{i,1928}$. $Y_{i,1928}$ we approximate from the asset information included in the same source as described in Section 3.1:

$$Y_{i,1928} = \alpha \cdot \Pi_{i,1928} = \alpha \cdot \frac{1}{\chi} \cdot W_{i,1928}$$

where $\chi = 18$ is the capitalization factor applied by German tax assessors (Statistisches Reichsamt 1930, p. 10) and $\alpha = 2.38697$ is the adjustment factor between income concepts, which we derive below.

For 1932, we project the debt stock forward, assuming a constant average yearly interest of 8%

$$\widehat{D_{i,1932}} = 1.08^4 \cdot D_{i,1928}.$$

For incomes in 1932, we rely on exogenous shifts in agricultural commodity prices and calculate

$$\widehat{Y_{i,1932}} = (1 + g^{Y}_{i,1928-1932}) \cdot Y_{i,1928}.$$

The following sections give details on the adjustment factor between income concepts α, the derivation of $g^{Y}_{i,1928-1932}$, and, finally, its calculation.

B.3.1 Adjustment between income concepts

To ensure consistency between the income concepts applied to calculate leverage ratios, both at the national and county levels, an adjustment is necessary. Note, though, that this adjustment merely affects coefficient size and not statistical significance. As laid out in Appendix A.1, national accounting of sectoral incomes excludes wages paid to laborers and owner-occupied housing, but includes own consumption and, of course, the notional wage of the farm owner. Contrastingly, the concept underlying the capitalization method to assess the tax value of farms ($Y_{i,1928}$) is net profits, i.e., incomes excluding notional owner's wages and own consumption. Fortunately, we have information on both and their relation to net profit for a subset of farms based on Fensch (1932), which presents results of a long-running agricultural accounting survey. Focusing on the years 1928–1930 and on grain producers over 5ha—representing roughly 40% of the farms surveyed —we derive the net profit to income factor as follows:

$$income = net\ profit + notional\ owner's\ wages + 0.5 \cdot own\ consumption$$

as, according to Bauer and Dehen (1938), housing makes up 50% of own consumption. The corresponding German terms in the original source are:

$$\textit{income} = \textit{Reinertrag} + \textit{Besitzerlohn} + 0.5 \cdot \textit{Eigenverbrauch}.$$

The adjustment factor α is then *income* divided by *net profit* and here, $\alpha = 2.38697$.

B.3.2 Derivation of the effect of commodity price changes on changes in income

Let the yearly net income of the farmer Y_t be defined as follows with p_s and q_s being the price and quantity for good s, and c_t capturing the overall cost in period t

$$\begin{aligned} Y_t &= V_t - c_t \\ &= \sum_s v_{s,t} - c_t \\ &= \sum_s p_{s,t} q_{s,t} - c_t. \end{aligned}$$

The absolute change in farm incomes between two points in time $t = 0$ and $t = 1$ (for us, those points will be 1928 and 1932) is then given as

$$\Delta Y = \left[\sum_s p_{s,1} q_{s,1} - c_1 - \left(\sum_s p_{s,0} q_{s,0} - c_0 \right) \right].$$

To proceed, we make two assumptions. First, the nominal costs remain constant, i.e., $c = c_0 = c_1$. This is reasonable in our case as, e.g., prices for farm machinery did not decrease at all, and those for fertilizer fell only very slightly according to Abraham (1981, p.194). Second, also the quantities remain constant, i.e., $q_s = q_{s,0} = q_{s,1}$, as production is determined in the short run by farm size, crop mix, and weather. Then,

$$\Delta Y = \sum_s \Delta p_s q_s$$

and the growth rate of farm incomes g^Y is given as

$$\begin{aligned} g^Y &\equiv \frac{\Delta Y}{Y_0} \\ &= \frac{\sum_s \Delta p_s q_s}{(\sum_s p_{s,0} q_s - c)}. \end{aligned}$$

Let us define $\zeta_0 \equiv \frac{c}{\sum_s p_{s,0} q_s}$, i.e., the cost as a fraction of sales in t_0, with $\zeta_0 \in (0,1)$. Then,

$$\begin{aligned} g^Y &= \frac{\sum_s \Delta p_s q_s}{\sum_s p_{s,0} q_s - \zeta_0 \sum_s p_{s,0} q_s} \\ &= \frac{\sum_s \Delta p_s q_s}{(1-\zeta_0) \sum_s p_{s,0} q_s} \\ &= \frac{1}{(1-\zeta_0)} \frac{\sum_s \Delta p_s q_s}{\sum_s p_{s,0} q_s}. \end{aligned}$$

Now define the growth rate of the price of product s as $g_s^p \equiv \frac{\Delta p_s}{p_{s,0}}$. Then,

$$g^Y = \frac{1}{(1-\zeta_0)} \frac{\sum_s g_s^p p_{s,0} q_s}{\sum_s p_{s,0} q_s}.$$

Finally, recall $V_0 = \sum_s v_{s,0} = \sum_s p_{s,0} q_s$ and thus,

$$g^Y = \frac{1}{(1-\zeta_0)} \sum_s \frac{v_{s,0}}{V_0} g_s^p$$

i.e., the change in income is the weighted average of price changes of commodities multiplied by the inverse of $1-\zeta_0$, where ζ_0 is the share of cost in sales in t_0.

B.3.3 Construction of weights and weighted change in income

Ideally, we would like to know the share of each product s in the overall sales of agricultural products per county, i.e., $\frac{v_{s,0}}{V_0}$, as discussed above. However, data on sales or production is limited. We thus rely again on the close relationship between agricultural income and asset values, also discussed above, and proceed in the following way.

We calculate county-level livestock wealth W^l in 1928 in county i based on the stock of livestock in 1925 (the closest available year) and market prices in 1928, while differentiating between cattle, pigs, and sheep as

$$W_{i,1928}^l = \sum_s Stock_{i,s,1925} * Price_{s,1928}.$$

As we use market prices for the livestock wealth, we adjust the tax values to market values by multiplying them by a factor of 1.92 based on Albers, Bartels, and Schularick (2026). We then calculate crop wealth W^c in 1928 in county i as the difference between the agricultural assets in market values and the livestock wealth calculated above

$$W_{i,1928}^c = 1.92 \cdot W_{i,1928} - W_{i,1928}^l.$$

This allows us to calculate a weight $w_{i,1928}^c = \frac{W_{i,1928}^c}{1.92 \cdot W_{i,1928}}$ to gauge the relative importance of crops and livestock for each county. On average, crops make up 75% of the wealth in a rural county. Within different types of livestock, we again weight with the stock in 1925.

Within different types of crops, we weight with the relevant cultivation area in 1925.[4]

We include price data for cattle, pigs, and sheep from Statistisches Reichsamt (1933b). We do not include horses, as they can be regarded as investment goods. Due to changes in which wholesale markets are included in the average price, we recalculate it including the following: Dresden, Berlin, Hamburg, Hannover, Frankfurt am Main, and Mannheim. Note that the differences are marginal, in line with our argument that markets were well integrated. Prices are given per living weight. In order to calculate stock in terms of living weight from the number of animals given in Statistisches Reichsamt (1929), we use the following relationship between slaughter weight and living weight from Grupe (1957):

- cattle: 52% of 230kg (table 38)
- pigs: 80% of 110kg (table 39)
- sheep: 60% of 22kg (table 40).

We include wheat, rye, barley, oats, potatoes, peas, hay, beans, carrots, rutabaga, and beets, and use prices from Statistisches Reichsamt (1933b) for all crops, except beets, which are taken from Hanau and Plate (1975, p.61). With this, we cover

- 72.9% of all plowland,
- 85.0% of plowland of farms over 5ha.

We calculate the change in income derived above, weight between products based on assets ($w_{i,1928}$), and readjust from market prices to tax values as

$$g^{Y}_{i,1928-1932} = \frac{1}{(1-\zeta_0)} \cdot \Bigg(\Big(\big(w^{C}_{i,1928} \cdot \sum_s \frac{Area_{i,s,1925}}{Area_{s,1925}} \cdot \frac{Price_{s,1932}}{Price_{s,1928}} + (1 - w^{C}_{i,1928}) \cdot \sum_s \frac{Stock_{i,s,1925}}{Stock_{s,1925}} \cdot \frac{Price_{s,1932}}{Price_{s,1928}} \big) \cdot 100 \Big) - 100 \Bigg) / 100 \cdot 1.92.$$

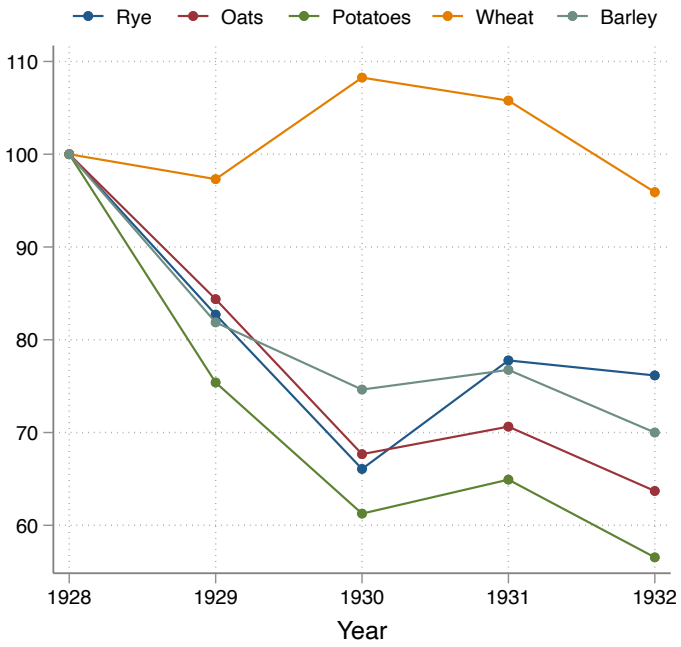
The predicted agricultural income in 1932 is thus

$$\widehat{Y_{i,1932}} = (1 + g^{Y}_{i,1928-1932}) \cdot Y_{i,1928}.$$

For illustrative purposes, Figure B.2 shows the price developments of Germany's five most important crops in terms of cultivation area between 1928 and 1932. For wheat, prices remained relatively stable around their 1928 values throughout the crisis. Other products experienced significant declines, such as rye (roughly 20%) and potatoes (roughly 40%). This variation in price declines is combined with initial crop shares as described above and exploited for identification in our analysis.

[4] In case of $W^{l}_{i,1928} > 1.92 \cdot W_{i,1928}$ and thus $W^{c}_{i,1928} < 0$—which occurs in four counties, three of them rural—we set $W^{c}_{i,1928}$ to zero.

Figure B.2: Crop prices, 1928-1932



Notes: Figure B.2 shows German wholesale prices for the five most important crops in terms of cultivation area (indexed to 1928). *Sources*: See Appendix A.

One remaining concern may be the potential adjustment of cultivation patterns to crisis conditions. In this scenario, this could mean, for example, farmers increasingly cultivating wheat as its prices remained stable. However, cultivation patterns are, to a large degree, dictated by geographic conditions and thus sticky. A case in point is a comparison to the 19th century: For Prussia, the in-sample correlation in crop shares for the five most important crops between 1882 and 1932 is on average 0.86, suggesting that crop patterns changed little. Thus, we expect little adjustment over the crisis period.

B.4 Validation of debt deflation measure

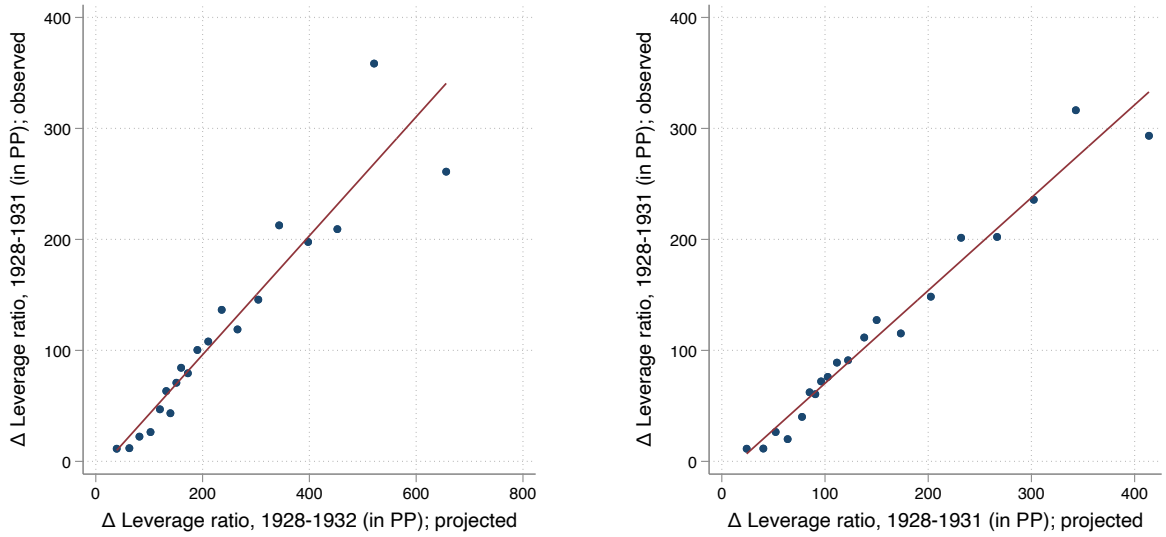
To calculate observed changes in the leverage ratio between 1928 and 1931, we rely on detailed official agricultural statistics. The 1928 values for the leverage ratio are readily available (Enquete Commission 1930). While data on debt stocks $D_{i,1931}$ are not readily available at the county level in 1931, they can be calculated by combining regional data on its relative development by farm size between 1928 and 1931, as well as county-level data on farm sizes. In particular, using the change in regional debt levels by farm size between 1928 and 1931 given in Deutsche Rentenbank-Kreditanstalt (1929, 1932) we derive a weighted average yearly growth rate per county ($Growth_i^D$) and project the debt stock forward such that $D_{i,1931} = (1 + Growth_i^D)^3 \cdot D_{i,1928}$. In doing so, the projected 1931 debt stock incorporates interest accumulation, repayments, and take-up of new debt.

On the income side, we employ the valuation statistics of 1931 to calculate agricultural income $Y_{i,1931}$ analogously to the derivation of $Y_{i,1928}$. Because the farm debt statistics in 1928 exclude very small farms, we use the 1931 and 1928 wealth valuation statistics (Statistisches Reichsamt 1930, 1939) to calculate the changes in prices per hectare for a given county between the two years. Unfortunately, those two publications are also not directly comparable in all counties for two reasons: First, the definition of agricultural land changes from land belonging to a firm mainly engaged in agricultural activity in 1928 to directly used for agricultural production in 1931. This leads to the inclusion of fallow land, forestry, and other unproductive areas in some of the 1928 values (two alternative measures with unclear distinction are given) and thus to an artificial decrease in the hectare prices of affected counties. Conversely, in 1931, the counting basis of the statistic was extended to include smaller farms, which tend to have higher per-hectare prices as the building value is included, thereby artificially increasing the 1931 values. Taken together, these inconsistencies in the statistics lead to the appearance of increases in farm wealth of up to 30%, which is implausible given the overall economic situation. We, therefore, exclude those counties where the ratio of alternative measures in 1928 is above the 75th percentile, and where log changes in the number of firms and hectares are above the 90th percentile. This leaves us with 179 counties that provide a reasonable basis for the validation of our debt deflation measure based on weighted price changes and the national-level effective interest rate.

To validate our measure of debt deflation $\Delta \widehat{Leverage\ ratio}_{i,1928-1932}$, Figure B.3a compares it to a change in leverage ratios derived from observed debt levels and land values as assessed by the authorities (both in 1931) for a subset of 179 rural counties with usable statistics in a binned scatter plot with each dot representing around 15 counties. There is a strong positive relationship. Remaining differences in the levels are largely due to the timing of the tax assessment. Tax values were assessed a year before our time frame of interest ends. Once we use our prediction for 1931 instead of 1932, these level

differences largely disappear, see Appendix Figure B.3b.

Figure B.3: Validation of debt deflation exposure

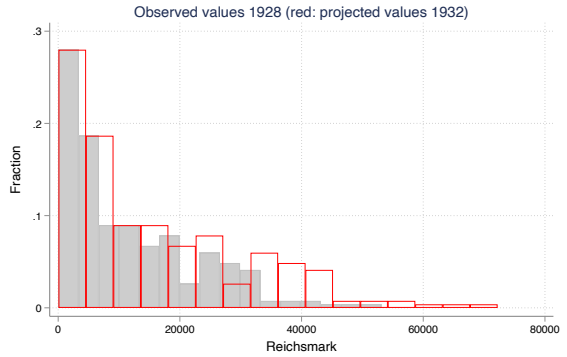


(a) Validation using 1928–1932 price changes (b) Validation using 1928–1931 price changes

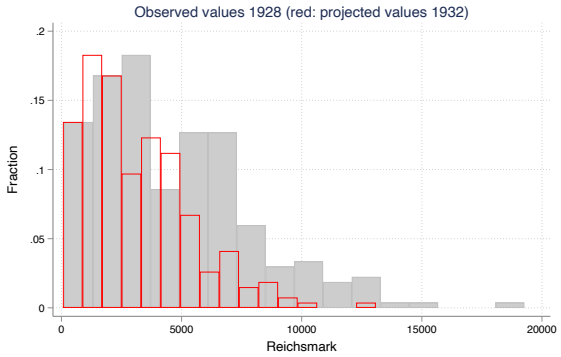
Notes: Both panels relate our predicted debt-deflation exposure (constructed from weighted national commodity price changes and pre-crisis balance sheets) to "observed" debt deflation computed from realized changes in debt levels and incomes for the subset of counties with comparable assessments. Panel (a) uses weighted commodity price changes over 1928–1932; Panel (b) uses 1928–1931. Outcomes are expressed in percentage points, and the figures report binned scatter plots. *Sources:* Data on land values and debt changes as described in the appendices; other sources are listed in Appendix A.

B.5 Distribution of debt deflation measure

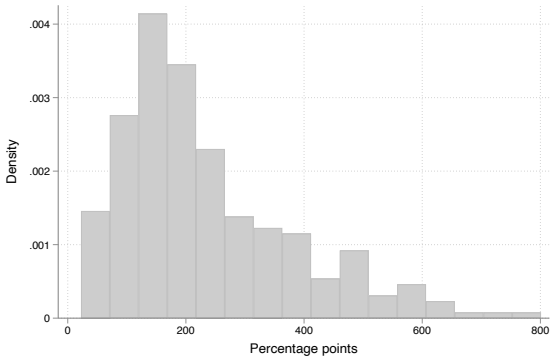
Figure B.4: Distribution of agricultural debt, income, and debt deflation



(a) Debt



(b) Income



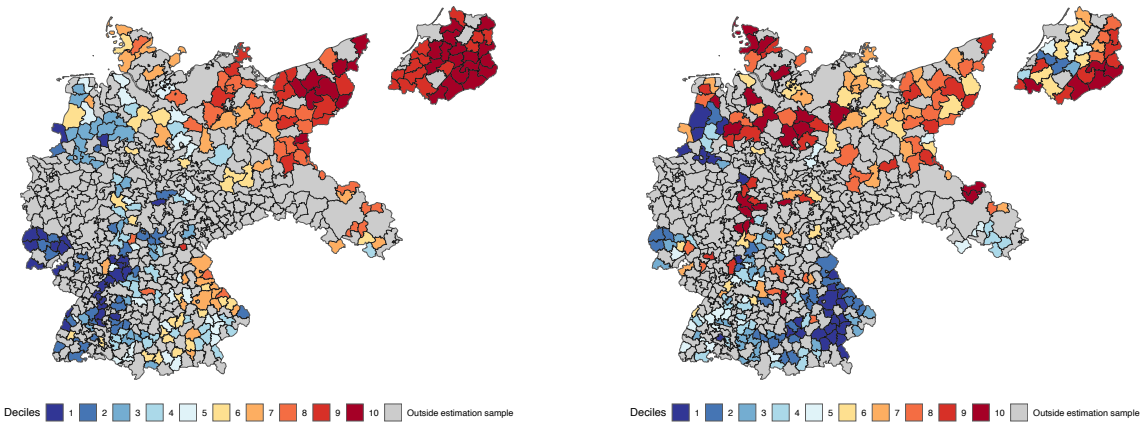
(c) $\Delta\widehat{Leverage\ ratio}_{1928\text{–}1932}$

Notes: The figure shows the rural sample. Panels (a) and (b) plot observed 1928 values (gray) and projected 1932 values (red) for the agricultural debt stock and agricultural income, respectively. Panel (c) plots the distribution of changes in the leverage ratio, $\Delta\widehat{Leverage\ ratio}_{1928\text{–}1932}$, our debt-deflation exposure measure. *Sources:* See Appendix A.

C Additional results and robustness

C.1 Descriptive patterns

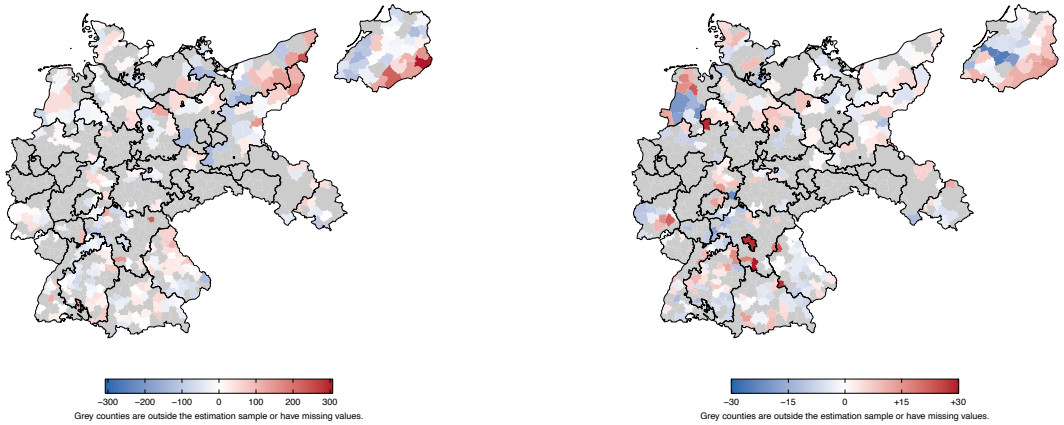
Figure C.1: Spatial distribution of debt deflation and NSDAP vote gains, 1928–1932



(a) $\Delta\widehat{Leverage\ ratio}$, 1928–1932 (b) Δ NSDAP vote share, 1928–1932

Notes: Both maps classify counties into deciles. Urban counties are shown in grey. Panel (a) shows the predicted change in the agricultural debt-to-income ratio, $\Delta\widehat{Leverage\ ratio}_{i,1928–1932}$. Panel (b) shows the change in the NSDAP vote share between the May 1928 and July 1932 Reichstag elections. *Sources:* See Appendix A.

Figure C.2: Within-electoral-district variation, 1928–1932



(a) $\Delta\widehat{Leverage\ ratio}$, 1928–1932 (b) Δ NSDAP vote share, 1928–1932

Notes: Both maps plot within-electoral-district (constituency) residualized variation at the county level. Rural counties are shaded by their residualized values, while urban counties are shown in grey. Panel (a) displays the residualized predicted change in the agricultural debt-to-wealth ratio, $\Delta\widehat{Leverage\ ratio}$, 1928–1932. Panel (b) displays the residualized change in the NSDAP vote share between the May 1928 and July 1932 Reichstag elections. *Sources:* See Appendix A.

C.2 Main results

C.2.1 Other elections, outcomes, and sample splits

Table C.1: Effect of debt deflation on NSDAP in September 1930, November 1932, and March 1933

Dep. var.	Δ Vote Share, NSDAP		
	1928–9/1930	1928–11/1932	1928–3/1933
	(1)	(2)	(3)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1930	0.011		
	(0.013)		
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932		0.021***	0.021***
		(0.006)	(0.007)
Mean dependent variable	12.56	26.43	42.75
SD dependent variable	7.45	12.93	11.80
Initial vote share	✓	✓	✓
Constituency time trend	✓	✓	✓
Controls	✓	✓	✓
R-squared	0.72	0.85	0.81
Observations	268	268	268

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are initial vote share, share of agricultural employment, share of self-employed and family members in agricultural employment, and share of Protestants. Sample is restricted to above median agricultural employment share.

Table C.2: Effect of debt deflation on NSDAP before 1929

Dep. var.	Δ Vote Share, NSDAP (proxy)		
	5/1924–12/1924	5/1924–1928	12/1924–1928
	(1)	(2)	(3)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	0.00015	-0.00012	0.00046
	(0.001)	(0.002)	(0.002)
Mean dependent variable	-2.35	-3.23	-0.88
SD dependent variable	2.62	4.12	3.09
Initial vote share	✓	✓	✓
Constituency time trend	✓	✓	✓
Controls	✓	✓	✓
R-squared	0.83	0.81	0.66
Observations	268	268	268

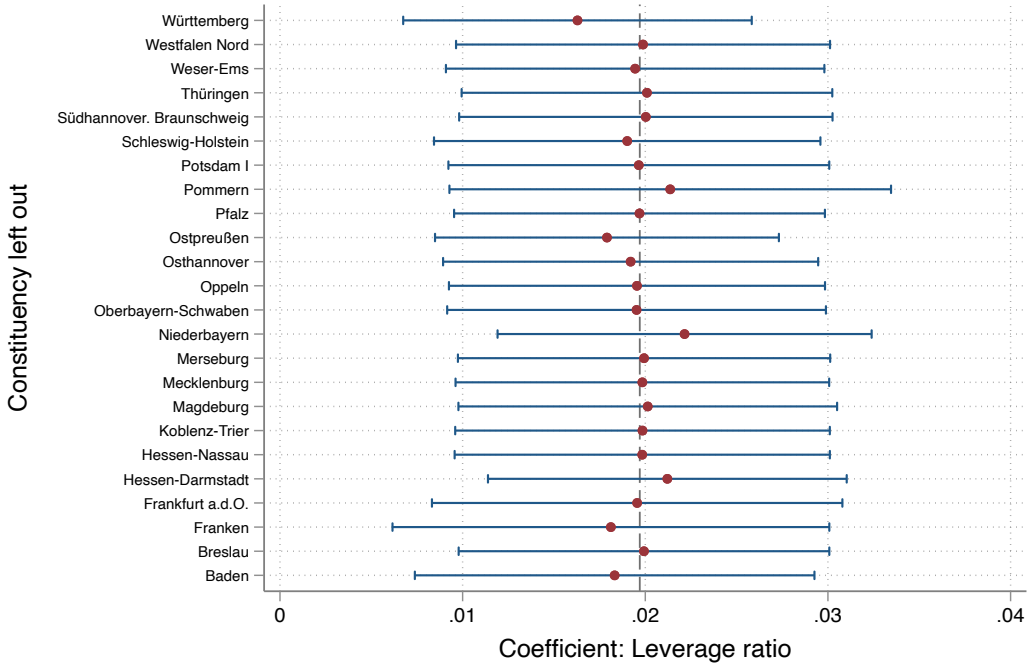
Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are initial vote share, share of agricultural employment, share of self-employed and family members in agricultural employment, and share of Protestants. Sample is restricted to above median agricultural employment share. Due to the NSDAP ban, it is proxied by the *Deutsch-völkische Freiheitspartei* in May 1924 and by the *Nationalsozialistische Freiheitsbewegung* in December 1924. There was no comparable party in 1920.

Table C.3: Effect of debt deflation on change in number of voters, 1928-1932

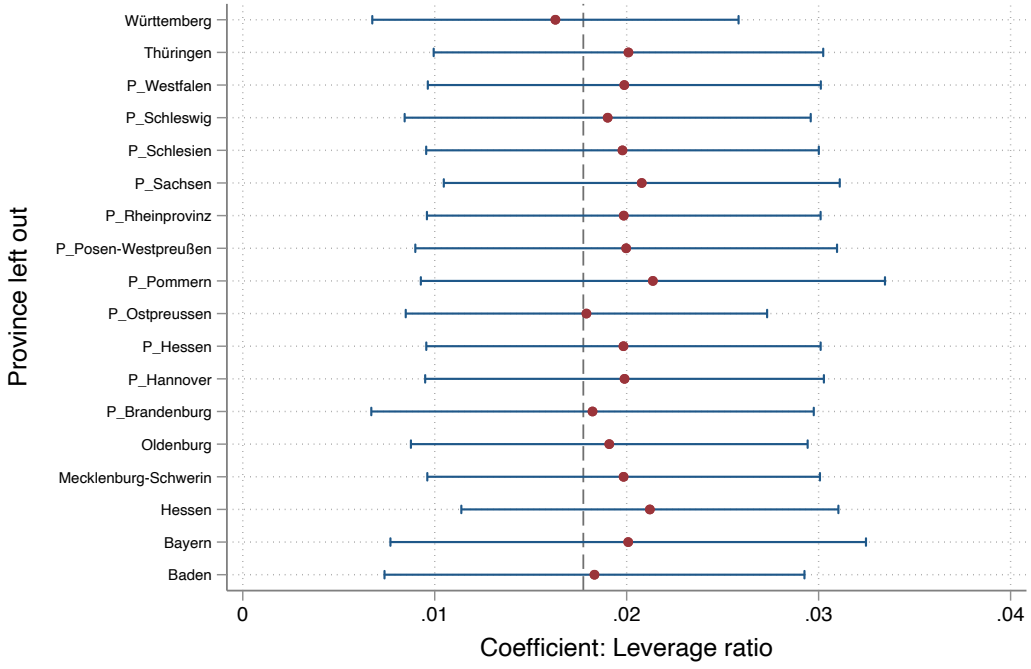
Dep. var.	Change in number of voters (in %) (1)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	0.001
	(0.004)
Mean dependent variable	8.90
SD dependent variable	4.47
Constituency time trend	✓
Controls	✓
R-squared	0.26
Observations	268

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of self-employed and family members in agricultural employment, and share of Protestants. Sample is restricted to above median agricultural employment share.

Figure C.3: Leave-one-region-out



(a) Leave-one-constituency-out



(b) Leave-one-province-out

Notes: This figure presents the results of leave-one-out analyses in which each constituency (*Wahlkreis*) (panel a) and each province (panel b) is excluded sequentially. *Sources:* See Appendix A.

C.2.2 Spatial persistence

A natural concern in our setting is that spatial dependence may lead conventional inference to overstate precision. To address this, we report Conley standard errors at various cutoffs in Appendix Table C.4, which allow for spatial correlation in the error structure across nearby observations. A further concern, emphasized by Becker, Boll, and Voth (2026), is that when spatial dependence is sufficiently strong, spatial unit-root behavior can give rise to spurious regression relationships, in which case standard spatial corrections alone may not be sufficient. Their proposed `spurtest` procedure is designed primarily for variables in levels, or for residuals from levels regressions, and their recommended workflow is to test first and transform second. However, first differencing is a natural choice in our context because identification comes from within-unit temporal change, and the transformation removes time-invariant unit-specific heterogeneity that could otherwise confound the relationship of interest. Because our baseline specification is estimated in first differences over time, the testing framework does not map exactly into our main estimating equation.

To nevertheless address the underlying concern about residual spatial persistence, we implement the Becker, Boll, and Voth (2026) residual-based diagnostics both in levels and in first differences. In our main specification, the residual I(0) test yields p-values of 0.8778 in levels and 0.8788 in differences, so we cannot reject spatial stationarity of the residuals. Importantly, when we omit controls capturing agricultural employment, ownership structure, and religion, the I(0) residual test in differences falls to 0.0395, indicating that these controls absorb an important share of the spatial structure in the data. The corresponding I(1) tests yield p-values of 0.0021 in levels and 0.0024 in differences, which reject the null hypothesis of a spatial unit root at the 1%-level. Taken together, these results suggest that once the full set of controls is included, there is no evidence that unmodeled spatial dependence is driving our findings, while the Conley-based inference reported in Appendix Table C.4 provides an additional safeguard against more standard forms of spatial correlation.

Table C.4: Spatial clustering, debt deflation

Dep. var.	Δ NSDAP vote share, 1928-32		
	Baseline	100km	200km
	(1)	(2)	(3)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	0.020***	0.020***	0.020***
	(0.005)	(0.005)	(0.004)
Mean dependent variable	30.89	30.89	30.89
SD dependent variable	14.37	14.37	14.37
Initial vote share	✓	✓	✓
Constituency time trend	✓	✓	✓
Controls	✓	✓	✓
Observations	268	268	268

Notes: Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Controls are initial vote share, share of agricultural employment, share of self-employed and family members in agricultural employment, and share of Protestants. Sample is restricted to above median agricultural employment share.

C.2.3 Decomposition of debt deflation

Table C.5: Decomposition of debt deflation into initial debt and income devaluation

Dep. var.	Δ NSDAP Vote Share, 1928–32				
	(1)	(2)	(3)	(4)	(5)
Debt per capita, 1928 (in log)	0.264***	0.166*	0.229***	0.218***	0.159**
	(0.085)	(0.093)	(0.074)	(0.072)	(0.076)
g^Y, 1928-1932	-0.133	-0.153**	-0.112**	-0.108**	-0.092*
	(0.100)	(0.061)	(0.044)	(0.053)	(0.050)
Mean dep. var.	0.00	0.00	0.00	0.00	0.00
SD dep. var.	1.00	1.00	1.00	1.00	1.00
Controls		✓	✓	✓	✓
Constituency time trend			✓		
Province time trend				✓	
State time trend					✓
R-squared	0.07	0.78	0.88	0.87	0.83
Observations	268	268	268	268	268

Notes: Standardized coefficients. Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of Protestants, share of self-employed and family members in agricultural employment, and initial vote share. Sample is restricted to above median agricultural employment share.

C.3 Other crisis channels

C.3.1 Further robustness on political interventions

Regarding our main results and the additional policy channels discussed, some robustness concerns may remain, which we address in Appendix Table C.6. In particular, primary beneficiaries of *Osthilfe* were large estates. Thus, we add the share of such estates (over 100ha) as a further control. Additionally, because the denominator of our debt-deflation measure uses crop composition to map national price declines into predicted income changes, we allow for differential time trends by agricultural specialization (crop cultivation versus animal production). The results remain unchanged.

Table C.6: Additional controls for agricultural policies

Dep. var.	Δ Vote Share NSDAP, 1928-32		
	(1)	(2)	(3)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	0.020***	0.019***	0.019***
	(0.005)	(0.005)	(0.006)
Mean dependent variable	30.89	30.89	30.89
SD dependent variable	14.37	14.37	14.37
Constituency time trend	✓	✓	✓
Controls	✓	✓	✓
Osthilfe (dummy)		✓	
Share estates		✓	
Specialization			✓
R-squared	0.88	0.88	0.88
Observations	268	268	268

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are initial vote share, share of agricultural employment, share of self-employed and family members in agricultural employment, and share of Protestants. Sample is restricted to above median agricultural employment share.

C.4 Other non-economic explanations from the literature

Having established the strong positive association between the increasing leverage ratios and the success of the NSDAP, we discuss in this part how our economic explanation for the rise of the NSDAP relates to the rich literature on this topic that does not focus on economic explanations. Among the many drivers that have previously been investigated, some have actually been shown to be insignificant for Nazi support, such as propaganda before 1933 (Adena et al. 2015; Selb and Munzert 2018). Others, while potentially important in urban centers, are unlikely to play a role in rural areas, such as social capital measured by club density, as used in Satyanath, Voigtländer, and Voth (2017). Yet others are discussed in the historical literature, but have not yet been quantitatively analyzed outside of urban centers due to a lack of data availability, such as violence (Bessel 1986).

Three non-economic explanations are, however, potentially relevant in our setting and can be added to our analysis by relying on previously published work: the legacy of WWI (Koenig 2023; De Juan et al. 2023), the role of religious elites (Spenkuch and Tillmann 2018), and persistent anti-Semitism (Voigtländer and Voth 2012).[5]

To test the potential role of these alternative explanations, we add the main relevant variables from each of these papers to our setting as an additional control. Building on De Juan et al. (2023), we add the number of WWI fatalities as a share of pre-war population; following Koenig (2023), we add the share of veterans. While we control for Protestantism throughout our analysis, Spenkuch and Tillmann (2018) specifically stress the role of Catholic priests who supported the NSDAP and thereby opposed the view from the church. Hence, we add a dummy variable which indicates the presence of at least one "brown priest" in a county to our regression, thereby allowing for a potential time-variant impact of these religious elites. From Voigtländer and Voth (2012), we take a dummy variable indicating a pogrom in the Middle Ages.[6]

The results in Appendix Table C.7 further validate our economic explanation. Our core variable of interest Δ*Leverage ratio*, 1928–1932 remains highly significant throughout and similar in size. The coefficient shrinks a bit in column 5 when using the smaller sample, for which information about historic pogroms is available.

[5] Of course, there are yet other explanations provided in the literature and this exercise remains selective by necessity.

[6] Data from De Juan et al. (2023) maps to our data based on identifiers used in Max Planck Institute for Demographic Research and Chair for Geodesy and Geoinformatics, University of Rostock (2011); to add data from Koenig (2023), we rely on areal interpolation. Finally, Spenkuch and Tillmann (2018) provide both their data and medieval pogroms based on Voigtländer and Voth (2012) which map to our data based on county-identifiers as used in Falter and Hänisch (1990).

Table C.7: Other explanations

Dep. var.	Δ NSDAP, 1928-32				
	(1)	(2)	(3)	(4)	(5)
$\Delta \widehat{Leverage}$ *ratio*, 1928-1932	0.020***	0.019***	0.020***	0.020***	0.014***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Fatal casualties per 1910 pop.		27.452			
		(24.340)			
Veterans per 1910 pop.			38.881		
			(30.300)		
Brown priest, dummy				5.066	
				(3.260)	
Hist. pogrom, dummy					1.195
					(1.290)
Mean dependent variable	30.89	30.92	30.89	30.89	33.77
SD dependent variable	14.37	14.40	14.37	14.37	14.21
Controls	✓	✓	✓	✓	✓
Constituency FE	✓	✓	✓	✓	✓
R-squared	0.88	0.88	0.88	0.88	0.92
Observations	268	267	268	268	119

Notes: Standard errors in parentheses. Robust standard errors clustered at the district level. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of self-employed and family members in agricultural employment, share of Protestants, and initial vote share. Sample is restricted to above median agricultural employment share. Column 5 is restricted to counties with non-missing data on medieval pogroms.

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