Losing the country: Debt, deflation, and the rural rise of the Nazi party*

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Abstract

Using interwar German agriculture as a case, this paper explores the political cost of debt deflation which we characterize with farmers' leverage ratios. Primary deficits drove their increase during 1924-1928, but deflation pushed them to unsustainable levels during 1929-1932. We construct corresponding exogenous county-level exposure measures and show their effect on economic distress as well as political radicalization. Our results suggest that debt deflation increased the Nazi party's rural vote share by over 8 percentage points relative to a counterfactual baseline scenario and was thus a necessary condition for its rural dominance and ascension to parliamentary power.

Keywords: Great Depression, Weimar Germany, NSDAP, extremism, debt deflation, economic crisis.

JEL classification: D72, N13, N54

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1 Introduction

What are the costs of deflation? A key lesson that the Great Depression teaches macroeconomists is that deflation is bad for the economy. In the mid-1920s, countries, firms, and households around the globe accumulated debts. These debts became unsustainable as deflation, induced by the gold standard and misguided monetary policy, led to a drop in income and asset prices and thereby increased the leverage of households and businesses (Bernanke, 1995). An under-appreciated lesson from this time period is that debt deflation is not only bad for the economy but also for incumbent governments. It represents a redistribution from debtors to creditors, creating demands for compensation by the debtor pressure groups. At the same time, governments have limited fiscal space in times of crisis to fulfill these demands. In consequence, debt deflation is likely to radicalize voters.

We study one of the most canonical cases of political radicalization, the rise of Nazism, through the lens of debt deflation. The forcefulness of debt deflation depends on the numerator (debt) and the denominator (either income or wealth) of the leverage ratio. We exploit the special setting of two consecutive crises in German agriculture between 1924 and 1932. Farmers rapidly took up new debt in the first crisis (1924–1928), the geographical variation of which was driven by exposure to cheap grain imports. The increase in liabilities led to political discontent with the status quo, but overall the success of far-right parties remained limited with the NSDAP hovering at around 2% of the vote in the 1928 election. When farm incomes and values dropped between 1929 and 1932 in response to the fall in commodity prices, refinancing the existing debt burden became impossible. The (correct) perception that the central government was unwilling or unable to alleviate their precarious situation through fiscal, monetary, or trade policy made farmers turn to Hitler.

After the end of hyperinflation in late 1923, German farmers were virtually debt-free. In 1928, they owed around 1.8 times their annual net production. Why did farmers accumulate so much debt so quickly? Using a standard decomposition for the evolution of leverage (Mason and Jayadev, 2014), we show that much of the changes in 1924 and 1925 originate in large primary deficits stemming from both productive investments and the reinstatement of pre-inflation debts. Since the hyperinflation had also ravaged the traditionally well-functioning cooperative credit market (Suesse and Wolf, 2020), high interest rates drove much of the rapid growth of the leverage until 1926-1928. A third factor determined the geographical distribution of debt uptake: The sudden import of large quantities of wheat and other grains from the Americas between 1924 and 1928 caused an income shortfall for farmers who found it hard to compete with the prices of foreign grains. The impact of this 'grain invasion' varied locally depending on the crops the farmers were growing. Adapting the approach by Autor et al. (2013), we combine national trade data with county-level cultivation areas in an import competition measure. We show that a 1 SD higher exposure

to grain imports explains 46% of a 1 SD in debt uptake per capita during these years. Consistent with James' (1988) narrative account of interwar agriculture, we show empirically that the increasing debt uptake led to support for anti-republican movements. Both the debt accumulation and the exogenous grain import shock variable predict support for a referendum on Germany's reparations (Young referendum) that was orchestrated by a group of right-wing politicians, including Hitler.

After 1928, the debt-income ratio continued to grow at the same speed as before. The drivers in the second debt crisis (1929-1932), however, were quite different. Commodity prices dropped substantially and, as a consequence, so did incomes and the general price level. Using the same decomposition as before, we show that farmers actually incurred primary surpluses, but that deflation and falling incomes led to a stark increase in their leverage. Moreover, building on earlier insights for the US (Rajan and Ramcharan, 2015), we show that the changes in the value of agricultural land depended heavily on the exposure to these commodity changes. In the spirit of Fisher's (1933) original theory of debt deflation, we construct as an indicator of debt deflation exposure for each county the change in the ratio of agricultural debt to farm wealth. However, instead of using the actual changes in the ratio, we only exploit changes due to the interest on the initial pre-deflation debt levels (in the numerator) and due to land values related to the commodity price declines (in the denominator). The resulting measure of debt deflation has two advantages: It is credibly exogenous to local political conditions and maintains a clear interpretation (percentage point changes in the debt ratio). For a subset of our data, we are able to validate it against changes in the actual debt ratio.

The effects of the exposure to debt deflation were both economic and political. The larger the shifts in the debt ratio, the more bankruptcies and foreclosures ensued. Voting outcomes reflect this economic hardship. Consistent with the historical record (Bracher, 1970; Evans, 2003; Childers, 2017), we provide quantitative evidence that the NSDAP was able to unify the rural protest vote. Our regression results suggest that 1 SD in the change of the debt ratio explains 17.5% of 1 SD in the change of the NSDAP vote share, corresponding to 2.5 percentage points (relative to a mean increase of 30.3 percentage points between 1928 and the July 1932 election).[1] To assess the overall relevance of debt deflation for the rise of the Nazis, we conduct a counterfactual exercise under the following two assumptions: First, better-functioning agricultural credit markets had allowed farmers to limit their debt uptake to capital investments (around 21% of actual indebtedness attained in 1928). Second, the government had stabilized land prices between 1928 and 1932, which could conceivably have been achieved through either devaluation (and reflation) or more aggressive agricultural protectionism. We show that such policies would have likely impeded the rise of the NSDAP. Indeed, their actual support was higher in the countryside than in cities in the elections after

[1]This effect size is similar in magnitude to other studies on the rise of the NSDAP (Voigtländer and Voth, 2012; Adena et al., 2015; Satyanath et al., 2017; Doerr et al., 2022; Koenig, 2023).

1930. However, the avoidance of debt deflation would have reversed this pattern by reducing rural NSDAP support by about 8.2 percentage points in July 1932. Such a shift in the rural vote would have shrunk the Nazi party's share in parliament from 37.3% to 35.1%. This would have been sufficient for other parties to form a majority coalition without the NSDAP and the Communist party. From this vantage point, debt deflation was a necessary condition for National Socialism's ascension to power.

Two policy options could have stopped the debt deflation in the agricultural sector. First, protective measures for agricultural products could have stabilized the farm incomes and land values. Indeed, tariff and non-tariff barriers for wheat showed that such measures were effective. However, German industrialists and workers opposed higher grain tariffs such that the tariff protection was not expanded to other grains (James, 1988). The second option was a devaluation of the German currency, which would have allowed price levels to recover and substantially lessened the severity of the Great Depression in Germany (Ho et al., 2022). The Brüning government opposed this solution as it did not want to threaten a resolution to the question of German reparation debt (Schiemann, 1980; Ritschl, 1998). Instead of fighting the underlying ill through either trade or monetary policy, the government decided to prop up farm incomes with subsidies and introduce ceilings for mortgage interest rates. Neither of these policies had the potential to succeed. First, despite their considerable size, subsidies were too small to compensate for the losses through debt deflation. Second, ceiling interest rates in scarce capital markets is unlikely to allow farmers to refinance existing debt.

These results speak to a long-standing literature exploring macroeconomic policy options under the crisis constraint of the Great Depression and their political implications. Relying on cross-country regressions or theoretical models, this literature typically finds that the depth of the Great Depression is indeed associated with an increase in extremist voting (De Bromhead et al., 2013), that the exit from gold (by allowing reflation) and expansionary fiscal policies would have lessened the severity of the Great Depression (Eichengreen and Sachs, 1985; Eichengreen, 1992; Eggertsson, 2008; Almunia et al., 2010), but that international and national constraints such as foreign debt and the experience of hyperinflation prevented the adoption of these policies (Wolf, 2008). More recently, this literature has gained new impetus by exploiting regional variation in the exposure to macroeconomic policies (Hausman, 2016; Hausman et al., 2019). However, we are not aware of any direct test of the debt deflation-radicalization relationship beyond our study. Complementary to the huge negative economic impact of debt deflation (Bernanke and James, 1991; Bernanke, 1995), its political costs demonstrated in this paper provide a further rationale for avoiding deflation by any means necessary.[2]

[2]This also speaks to the German-specific debate about policymaking and policy space in the interwar period, the so-called Borchardt thesis (see, e.g., von Kruedeuner (1990) and Ritschl (2023) for summaries of varying length, and Ettmeier et al. (2024) for a recent quantitative contribution to it). At its core, it states that the limited policy space of the early 1930s–due to high wages in the 1920s and external debt problems–made the deflationary and austerity policy of then-chancellor Brüning inevitable. Holtfrerich (1990) and Ho et al.

We also contribute to a growing empirical literature in economics and political science analyzing electoral support for the NSDAP. A substantial body relates the rise of the Nazi party to short- or long-term cultural and political legacies (De Juan et al., 2023; Koenig, 2023; Galofré-Vilà, 2023; Voigtländer and Voth, 2012), strategies of the NSDAP (Adena et al., 2015; Satyanath et al., 2017; Caesmann et al., 2021), and religion (Spenkuch and Tillmann, 2018; Becker and Voth, 2023). Unlike an older literature on the impact of economic factors on the rise of the NSDAP (Falter, 1992; King et al., 2008; Thurner et al., 2015), our work exploits economic shocks to establish causation. In this sense, our analysis is most closely related to the work by Galofré-Vilà et al. (2021) on austerity, by Doerr et al. (2022) on the impact of the 1931 banking crisis, and by Brey and Facchini (2024), who study the economic and political consequences of the trade collapse. Our study is complementary to the existing work in that it focuses on the rural electorate rather than cities and that it provides evidence for a new economic channel for the rise of Nazism.

The remainder of this paper is structured as follows. Section 2 characterizes debt uptake and debt deflation in interwar German agriculture. Section 3 and 4 provide analyses of the economic and political consequences of the corresponding crises, respectively. Section 5 concludes.

2 Debt deflation in interwar German agriculture

The following section characterizes the debt deflation in interwar German agriculture. Section 2.1 describes the structure and evolution of debt levels using the leverage ratio. It highlights that the severity of debt deflation depends on both the numerator (the level of debt) and denominator (either the value of income or assets). Consequently, Section 2.2 discusses the underlying reasons for the rapid debt uptake between 1924 and 1928 while Section 2.3 turns to the subsequent changes in the denominator between 1929 and 1932. Finally, Section 2.4 discusses actual and potential policy responses to the debt crisis.

2.1 The farmers' leverage

Even though Fisher (1933, p. 345) did not use the term leverage, he employed the concept to measure "over-indebtedness" by relating the level of debt to both national wealth and income. Fisher himself did not take a stance on whether to use assets or income in the denominator. Indeed, such a distinction would be an artificial one in the context of German interwar agriculture: Farm values were assessed by capitalizing the net revenues of past years—practically equivalent with farm income—with the factor 18 (Statistisches Reichsamt, 1930, p. 10) Hence, the main difference between using income versus assets in the present

(2022) contest this view. Ritschl (2023), a proponent of Borchardt's views, maintains that a devaluation was only possible with help of the extreme right and would have led to a default (and the respective international repercussions).

context pertains to measurement error and frequency: While the assessed farm values may be less susceptible to the former than annual incomes, they were only re-assessed every three to four years. Depending on the required frequency and in accordance with Fisher (1933), we employ either assets or income in the denominator to calculate leverage ratios.

To estimate the leverage ratio for the period 1923-1932 and to characterize its changes, we use the income concept to benefit from the higher frequency of available income data vis-à-vis farm values. In particular, we employ the 1936 benchmark estimate for agricultural net value added by Fremdling (2010), which we extrapolate backward by using the contemporary sectoral GNP estimates. These also allow us to calculate the GNP deflator as a measure of inflation and real income growth in the agricultural sector during this period.[3] The existence of estimates of total agrarian debt, its structure, and the total interest payments by the sector in each year is a product of the debt crisis itself. It spurred a parliamentary inquiry (Enquete Commission, 1930) and considerable contemporary follow-up work extending the baseline estimates (Beckmann et al., 1932; Kokotkiewicz, 1932; Bauer, 1939). These sources allow us to distinguish (long-term) mortgage debt, short- and medium-term debts with credit institutions, reinstated debt (following the currency reform), and a non-negligible residual category, which includes tax arrears and informal personal loans. Note that having both data on interest payments and the nominal debt stock allows for calculating effective interest rates.

Figure 1(a) provides the first characterization of the farmers' leverage by relating different types of debt to nominal farm income. Between 1923 and 1932, German farmers' leverage increased from 0 to 270%. Given that the relationship between debt and the size of the economy was roughly stable in the long run before World War II (Schularick and Taylor, 2012), the proportion and speed of the change in leverage over the course of the Great Depression and the preceding years is extraordinary. While the importance of mortgages increases in the early period, the structure of the remaining debt is by and large stable after 1925 (when reinstated debt enters the total debt burden). Moreover, the increase in the leverage appears relatively constant. These two elements of stability, however, hide substantial changes in the nature of debt accumulation over time.

Following Mason and Jayadev (2014), a simple but powerful way to characterize the proximate reasons for changes in the leverage of a particular sector in the economy is to adapt the law of motion of government debt:

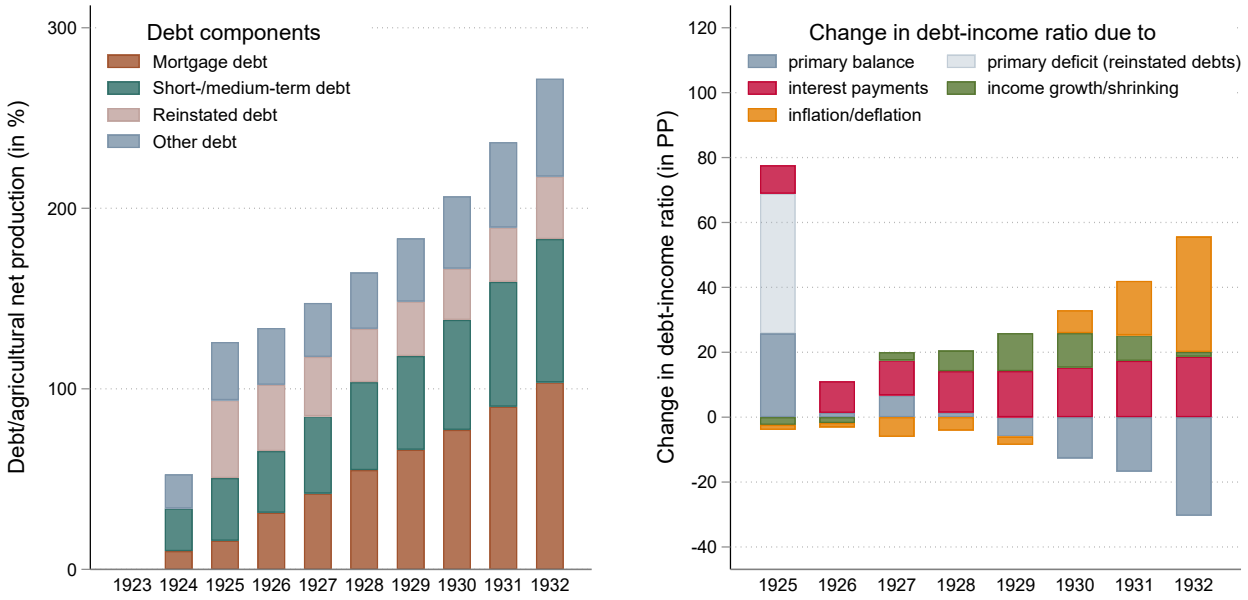
$$\Delta b_t \approx d_t + (i_t - g_t - \pi_t) b_{t-1}, \tag{1}$$

where Δb_t is the absolute change in the gross debt-to-income ratio between t and $t-1$. d_t is the primary balance—net borrowing minus interest payments—over income.[4] i is the

[3] See Appendix A.1 for the full description of sources and transformations.

[4] Defaults are implicitly covered in the primary balance, i.e., as a deleveraging of the agricultural sector; a problem akin to that for the decomposition of US household debt (Mason and Jayadev, 2014).

Figure 1: The evolution of agricultural debt, 1924-1932.



(a) Agricultural debt-income ratio

(b) Decomposition of changes in debt-income ratio

Notes: Figure 1(a) shows the ratio of debt over gross value added of the agricultural sector (denoted as income). It differentiates long-term mortgage debt, short- and medium-term debt with credit institutions, low-interest reinstated debt (a 25% re-establishment of pre-inflation debts), and a residual group of hard-to-measure 'other debts', including tax arrears and informal personal loans. Figure 1(b) provides a decomposition of the changes following Mason and Jayadev (2014). *Sources*: See Appendix A.

nominal interest rate, g the *real* growth rate, and π is the inflation rate. b_{t-1} denotes the gross debt ratio in the previous period. Mason and Jayadev (2014) call i, g, and π 'Fisher variables' as they reflect core elements of Fisher's debt deflation theory. In contrast, the primary balance reflects a more or less deliberate debt uptake.

Figure 1(b) provides the results of the decomposition based on the sources described above. It is apparent that the nature of debt accumulation changed with respect to the roles of the primary balances and 'Fisher variables'. In the first phase (1924-1928), farmers had primary deficits of varying magnitudes. In the second phase (1929-1932), farmers accrued primary surpluses. Nonetheless, the leverage ratio increased because of falling incomes, interest payments, and deflation. What were the fundamental rather than proximate reasons for these developments during the two agricultural crises of the interwar period?

2.2 Debt accumulation: 1924-1928

At the beginning of currency stabilization in late 1923, German farmers had virtually no debt as most had paid back their liabilities in worthless paper marks (Wehler, 2008, p. 282). Relative to other groups in society, farmers, whose high debt had been of concern among credit providers and political circles before World War I (Nipperdey, 1998, pp. 201-202), had

been winners of the hyperinflation (Albers et al., 2022). However, pre-war mortgages were reinstated at 25% of their old value by law in 1925. The set interest rate was moderate (4.5%) and repayment would not be required until the 1930s (Bauer, 1939, pp. 25-26). While the reinstated debt of around 2 billion Reichsmarks—corresponding to 3.3% of national income (based on Ritschl and Spoerer, 1997)—was non-negligible, making up around half of the primary deficit in 1925 (Figure 1(b)), it only explains the evolution of agricultural debt to a limited extent. By 1928, farmers had already accumulated new debts of about 9 billion marks, putting them on par with pre-war mortgage debt.[5] What economic hardship among farmers and which agricultural credit market conditions facilitated such a fast increase in debt?

The high demand for agricultural credit originated from three factors: First, the war economy had affected the productivity of farmland substantially. The loss of workers, depletion of livestock, and lack of investment into land and machinery meant that output was lower than before the war (James, 1988, p. 246). Agrarian politicians were aware of this lack of productivity. They advocated for intensifying farming with such enthusiasm that their efforts would later be called intensification propaganda (*Intensivierungspropaganda*). Given the high levels of depreciation of the existing capital, farmers often needed to rely on short-term credit to even keep the capital stock intact (Enquete Commission, 1930, pp. 90-92). Second, in the early years of the Weimar Republic farmers faced a high tax burden with estimates varying between a factor of 3.7 and 7 relative to the low pre-war tax burden (Becker, 1990, p. 231). As Becker (1990, p. 233) states further, the government solved its liquidity crisis by sending the agricultural sector into one, increasing the demand for credit. These high taxation levels were reversed only from 1925 onward, eventually leading to a very low tax burden, with farm incomes being virtually tax-free after 1928 (Becker, 1990, p. 241). The third factor was the competition of cheap foreign grains from the Americas, which affected farmers' incomes negatively. von Bissing (1933, p. 92) even compared this competition to the Grain Invasion of the 1870s. Indeed, there are similarities with the 19th-century counterpart (see O'Rourke (1997) for a description), but also one marked difference: Germany's agricultural tariffs were much lower in the interwar years, both for external and internal reasons. Externally, the Treaty of Versailles only allowed a return to independent tariff policy by 1925. The debate over this return prompted a dissolution of the governing coalition in 1924 as, internally, German industrialists and workers had a strong interest in maintaining open markets to profit from export opportunities and cheap raw materials (Abraham, 1981 and James, 1988, Chapter 7). Taken together, the lack of productivity, unprecedented levels of taxation, and foreign competition drove up the demand for credit.

This high demand for credit met a dysfunctional supply side. Before the war, a substan-

[5]The reinstatement of mortgage debt was 25%, such that its pre-war value must have been around $2.3b \times 4 = 9.2$b Reichsmark. See Kokotkiewicz (1932, pp. 7-11) for a comparison of pre- and post-WWI mortgage debt.

tial share of the credit supply had been provided by cooperatives. The deposits of farmers were channeled through their national associations on the money and mortgage markets. Farmers could then borrow at local banks at moderate interest rates of around 4%, both for mortgages and short-term loans. By eradicating the deposits, the hyperinflation destroyed this credit market (Enquete Commission, 1930, pp. 8 & 79). In the 1920s, the financing instead went from top to bottom. Credit institutions, including the cooperatives, had to borrow from other sectors and abroad at high interest rates to provide capital to farmers. As a case in point, the Association of Prussian Cooperatives Bank (*Preussische Zentralgenossenschaftskasse*) turned from a net creditor into a net debtor (Enquete Commission, 1930, pp. 53 & 79). Unlike the situation before the war, this structural change made the agricultural credit supply chiefly dependent on the general credit conditions, especially for short- and medium-term debt. Clearly, there was a substantial lack of credit in the German economy after the war (James, 1988).

In equilibrium, the weak supply of new credit and the strong demand were reflected in high interest rates which varied between 10.5% for mortgages and 24% for short-term loans (Bauer, 1939, p. 24). Because of the general lack of capital in the economy, mortgage loans were only issued to a very limited extent until 1925 when Germany regained access to the international capital market (see Figure 1(a) and Enquete Commission 1930, p. 79)[6] and even then, interest rates remained high. Our own estimate for interest on the whole agricultural debt stock (including low-interest reinstated debt) is 8.6%. Wagemann (1929, p. 202) even reports average interest rates of 9.25% for mortgages and 12% for short-term loans at the end of the 1920s. Even though the high interest on short-term loans due to the associated risk made them undesirable, the lack of alternatives forced farmers into a debt spiral they could not escape within the brief lifespan of the Weimar Republic. Figure 1(b) illustrates this predicament: Interest payments became an important explanatory factor for changes in the debt ratio as early as 1926.

In sum, low levels of productivity, high taxation, and depressed revenues caused by foreign competition forced farmers to take up debt at extremely high interest rates dictated by a dysfunctional credit market. In consequence, the agricultural sector in Germany went from debt-free to greatly indebted in the space of only five years (1923-1928).

2.3 Debt deflation: 1929-1932

Fisher's (1933, p. 341) debt deflation theory rests on the insight that nominal debt contracts of households and businesses are sticky while incomes and net worth are not. A fall in prices leads to an increase in leverage as the net worth and profits of businesses fall. These in turn lead to a reduction in employment, hoarding, and questions about the long-term profitability

[6]The fact that at its peak in 1927 the share of foreign credit in new agricultural mortgages was 62.5% (Bauer, 1939, p. 8) further shows this dependence on international lenders.

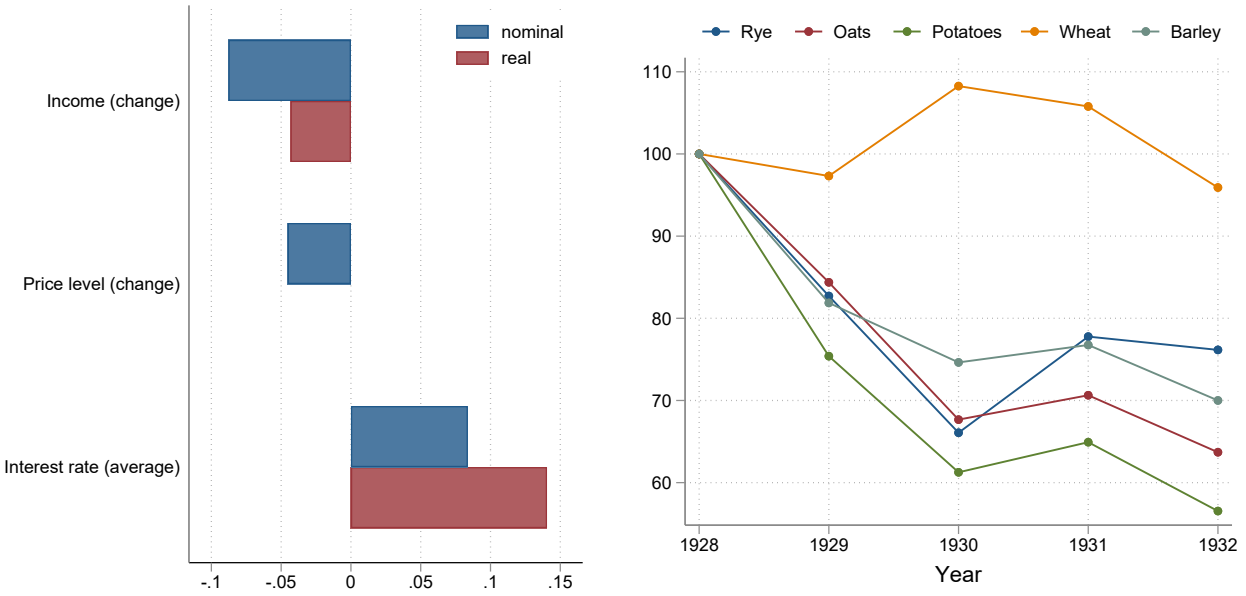
of the business. This can trigger fire sales, which further decrease asset prices, pushing firms and households into vicious debt cycles. Within their decomposition framework, Mason and Jayadev (2014) identify incomes, prices, and interest rates as reflective of the debt-deflation theory ('Fisher variables'). Figure 1(b) suggests that these 'Fisher variables' were indeed the reason for the steady increase in leverage after 1928. How did they evolve and why?

Between 1928 and 1932, the annual fall in agricultural incomes was 4.3% in real terms, corresponding to 8.8% nominally (see Figure 2(a)). Agricultural incomes depend on the sales of agricultural produce—the product of commodity prices and quantities—and the cost of farm inputs. While yields remained relatively stable below pre-war levels (Ziemann, 2022, p. 501), the key variable governing the decline in agricultural incomes between 1928 and 1932 was the fall in commodity prices after relative stability during the period 1924-1928. Figure 2(b) documents this by focusing on the five most important grains. Relative to 1928, prices for potatoes and oats, in particular, dropped by more than 30% and the prices for rye by more than 20%. All grains were subject to tariff increases and some, rye and wheat in particular, to non-tariff barriers (Gessner, 2006; van Strakosch, 1932). In the case of wheat, after a price decline of around 15% between 1926 and 1928, the government forced mills to use a certain proportion of domestically produced wheat (*Mahlzwang*). This draconian measure–the required domestic share was raised from an initial 30% to 97% in 1931/1932 (van Strakosch, 1932, p. 166)—appears to have played a large role in stabilizing the wheat price in subsequent years. Apart from wheat, commodity prices fell more than the price level of the whole economy. However, this does not imply that overproduction was the predominant reason for the fall of commodity prices or even the general price level. Instead, this fact likely reflects that incomes in agriculture—less sticky than in other sectors—reacted more strongly to the negative demand shock associated with the Great Depression (Federico, 2005). The fact that farmers could not exit the sector—due to the Depression of urban labor markets—meant that they continued to work in the agricultural sector at lower incomes.

The second important driver of the debt-income ratio during the period 1929-1932 was the economy-wide deflation. The average annual change in the GNP deflator during this period was about -5%. When inflation is positive the real level of debt decreases. Conversely, the deflation present in those years increased the real level of debt. The reasons for the deflation in Germany and elsewhere are well understood. Countries, particularly those that had experienced hyperinflation in the early 1920s such as Germany, accepted deflation as the lesser evil to be able to cling to the gold standard (Eichengreen, 1992; Wolf, 2008). In consequence, the domestic price levels continued to fall. Germany, which was additionally bound by the constraints of the unresolved reparation question, maintained her parity *de jure* and avoided a monetary reflation.

The third 'Fisher variable' is the effective nominal interest rate. The average nominal level of the interest was around 8% between 1928 and 1932 (Figure 2(a)) and remained,

Figure 2: 'Fisher variables' and commodity prices



(a) Averages of 'Fisher variables', 1928-1932

(b) Grain prices, 1928-1932

Notes: Figure 2(a) depicts the 'Fisher variables' income growth and price level in changes between 1928 and 1932, as well as the average interest rate over the same period. Figure 2(b) shows German wholesale prices for the five most important grains (indexed to 1928). *Sources*: See Appendix A.

by and large, constant. Hence, as in the years before 1928, the required interest payments played a large role in increasing the debt-income ratio. Besides the malfunctioning of the agricultural credit markets following the hyperinflation (discussed above), the capital flight after 1929 (Accominotti and Eichengreen, 2016; Ritschl, 2012) increased the general capital scarcity. Finally, government measures such as interest ceilings and enhanced foreclosure protections in the early 1930s decreased the supply of farm loans (Kokotkiewicz, 1932, p. 22). To visualize the resulting increasing real debt burden, Figure 2(a) also reports the average effective real interest rate between 1928 and 1932.[7] Unlike its nominal counterpart it increased over the period 1929-1932 and averaged more than 14%.

The proximate reasons for the increasing leverage ratio in the second phase of the debt crisis in interwar German agriculture differed substantially from those in the first one: Falling incomes and deflation replaced primary deficits while the importance of interest payments continued to grow. Correspondingly, the ultimate reasons also differed. The fall in commodity prices reduced incomes, the adherence to the gold standard prevented reflation, and the general capital scarcity and government measures further limited the supply of credit. As a consequence, the debt levels became unsustainable. This is best documented by the ratio of foreclosed farms relative to total farms, which tripled between 1928 and 1932

[7]The real interest rate is calculated using the Fisher equation: $r = \frac{(1+i)}{(1+\pi)} - 1$,

(Abraham, 1981, p. 86).

2.4 Actual and potential policy responses to the agricultural debt crisis

The predicament of the farm sector was well understood at the time as evidenced by a parliamentary inquiry (Enquete Commission, 1930) and substantial intragovernmental discussion (Abraham, 1981). This begs the question of what policies the government implemented and, perhaps more importantly, which policy was not attempted but would have been effective.

The traditional representative of the rural electorate, at least in Protestant regions, had been the conservative DNVP whose vocal support for tariffs delivered a strong electoral success in 1924. However, while being part of multiple government coalitions until 1928, it was unable to implement more than modest protective measures under the pressure of the better-organized export-oriented industries (Gessner, 1977, p. 14). Already the re-establishment of the pre-war tariff schedule in 1925 showed the dilemma: Strong opposition did not only come from the Social Democrats, who feared decreases in the real wage, but also from parts within the governing *Zentrum* party that catered to workers and unions (James, 1988, p. 259). Overall, farmers considered all protective efforts insufficient. The DNVP lost ground from 1928 onward and dropped out of the government. Farmers began to join more radical non-parliamentary movements such as the *Landvolk* movement in northern Germany. It organized large protests—around 140,000 farmers in 17 cities in 1928—and ultimately inspired the establishment of local special interest parties all over Germany in the following years (see, e.g., Heberle (1963) for the connection to the debt issue). To some degree, more centrist and left parties, including the SPD, followed with new agrarian programs (James, 1988, pp. 255f). The subsequent governments increased tariffs and non-tariff barriers. However, these did not satisfy the farmers' demand either as the SPD's losses in the 1930 election suggest (Gessner, 2006, p. 136). Overall, trade policy remained constrained mostly by the diverging interest between the rural and urban electorates. Where it was applied most radically as in the case of wheat, it proved effective in stabilizing prices. However, the governments paid a high price with respect to the urban vote without managing to regain ground in the rural areas.

Because of the inherent difficulty of the tariff question, the government began to explore other ways to limit indebtedness. Given the budgetary constraints, farmers had only received limited transfers in the mid-1920s (Abramowski, 1988, pp. LXI-LXIII). In the subsequent years, the central government instituted an ever-growing subsidy program called Aid for the East (*Osthilfe*), named after its primary geographic target East Prussia. The main elements of the program were the provision of new credit, the conversion of existing high-interest into low-interest debt, and the provision of credit subsidies (James, 1988, p. 261; Bauer, 1939, p. 36). Until 1931, the government had spent 2 billion marks on the program (Wehler, 2008, p. 283), a considerable share of the central government's budget which aver-

aged a little less than 19.7 billion marks in these years (calculation based on Weitzel, 1967). Despite its size, the program was anything but a success. First, while large compared to the budget, it proved insufficient and the consolidation of short-term debts remained incomplete (James, 1988, p. 267). Second, most of the money was spent on the most indebted and unproductive farms (Wehler, 2008, p. 282). Third, there was a strong bias towards large farms, and only a small fraction of those that had applied for aid actually received any (Wehler, 2008, p. 282; Treue, 1992, p. 591). Finally, there were cases of corruption associated with the program (Treue, 1992, p. 592). All these factors limited the ability of the governing parties to turn the subsidies into political support.

The government's third set of policy measures interfered directly with credit markets. Through a set of presidential emergency decrees in the early 1930s, interest ceilings were introduced and foreclosing indebted farms was made more difficult (Kokotkiewicz, 1932). Predictably, these measures were no cure for the underlying problem and had negative effects on the supply of credit. First, even reducing the nominal interest of mortgages could not revert the trend of increasing real interest rates (Figure 2(a)). Second, it created incentives to withhold payments for farmers that actually could pay their mortgages (Kokotkiewicz, 1932, p. 23). Third, the radical interference in credit markets decreased trust on the side of institutions providing credit (von Bissing, 1933, p. 102). As a consequence, it further constrained credit and "transformed a crisis of agricultural debtors into one of agricultural creditors" (Kokotkiewicz, 1932, p. 26). Hence, while some farmers might have benefited from these credit market policies in the short run, it is not clear that these policies were a net benefit even to the group that they were supposed to help.

In sum, all attempts at mitigating the debt crisis failed. Trade policy was constrained by diverging domestic interest over agricultural protection. The ability to subsidize struggling farms was limited and the eventual relatively large program a failure, both in its design and its execution. Interference in the credit market predictably did not help. The results from our analysis of the debt deflation suggest that the only possible solution to the agricultural debt question—very much in line with Fisher's (1933) original policy prescription—was leaving the gold standard and reflating the economy. While there exists a strong temporal correlation between the failed economic policies of the 1920s and early 1930s, the debt accumulation and debt deflation, the radicalization of the rural electorate, and ultimately the rise of the Nazis, it is not self-evident that there is a causal link between these developments. In the following, we hence establish that the growing debt accumulation led to discontent with the government between 1924 and 1928 and that the Nazi party was able to capitalize on the predicaments caused by the debt deflation between 1929 and 1932.

3 Debt accumulation and discontent

Among the three demand-side reasons for the debt accumulation between 1924 and 1928 was the competition of cheap grains from the Americas. Unlike the other factors (low productivity due to the war and high taxes), the exposure to this competition varied across small geographic areas. Sections 3.1 and 3.2 document the effects of this import shock on economic and political outcomes, respectively.

3.1 Characterizing the local exposure to the 'second grain invasion'

At the time of stabilization, German farmers were exposed to market conditions and foreign competition for the first time in 10 years. During the war, imports of any kind were largely suppressed by the Allied blockade, followed by four years of planned economy that included food rations and price caps.[8] Naturally, the hyperinflation, too, suppressed imports as the German currency had no purchasing power.

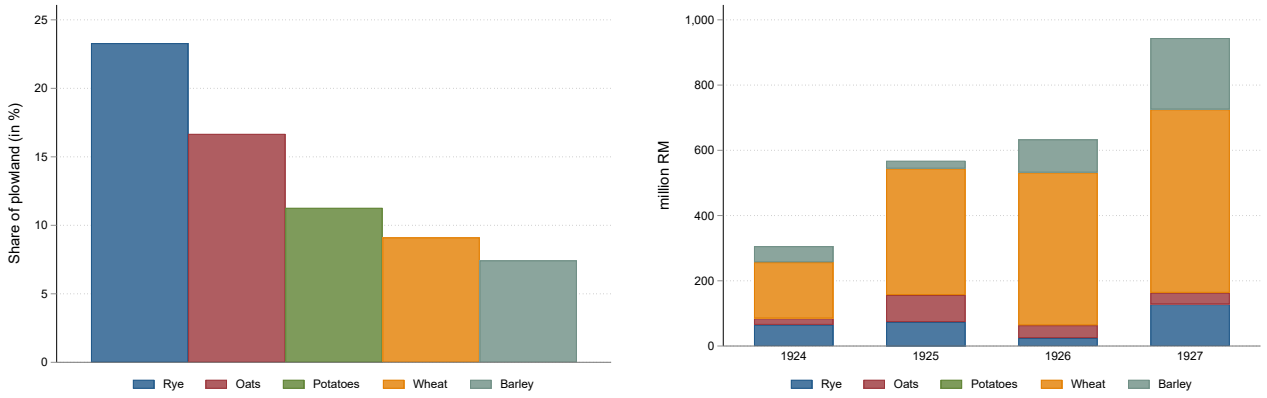
With the currency stabilization and the reintegration into the world economy, German farmers were exposed to a massive shock. Throughout the war and early 1920s, grain exporters in the New World, especially Argentina, Canada, and the US, had increased their output through mechanization and the use of artificial fertilizer (League of Nations, 1931, p. 17). Wheat production is a case in point. Relative to the period 1909-1913, Canada's wheat output grew by ≈150%, US wheat output by ≈25%, and Argentina's wheat by ≈95% in the period 1925-1927. As a result of the international supply conditions, Germany doubled its agricultural imports relative to before World War I (Wehler, 2008, p. 281). Comparing the imports to domestic production provides another yardstick for the extent of the shock: They accounted for more than one-third of the gross value of domestic agricultural production in 1925 (Abraham, 1981, p. 71).

Figure 3 summarizes both the cultivation areas and imports for the most important grains. Rye, oats, potatoes, wheat, and barley made up around two-thirds of the total cultivated area. The imports of these five most cultivated crops—70% of them coming from three countries (Argentina, Canada, US)—tripled between 1924 and 1927 and rose from around 300 million RM to more than 900 million RM (own calculations, for data sources see Appendix A). Naturally, these imports put downward pressure on grain prices, and hence farmers' revenues decreased in real terms relative to the pre-war period.[9]

[8] Even though the German government did import grain between 1920 and 1922 to make up for declines in productivity and territorial losses, per-head consumption was still lower than before 1914. The government requisitioned 2/7s of the harvest and imported an amount corresponding to 2/7s of the harvest, which it sold at massively reduced prices (2/3s of the world price) while prohibiting exports. Farmers were free to sell the rest of the harvest at the price set by the government (Gaskill et al., 1922).

[9] As input prices increased during the same time, the purchasing power of farmers fell by around 5% in the early 1920s as compared to 1913 (League of Nations, 1931, p. 173). Appendix Figure C.1 shows the total exports of the five most affected products compared to imports from Argentina, Canada, and the US. Exports

Figure 3: Crop cultivation areas and imports



(a) Cultivation areas, 1925

(b) Crop imports, 1924-1927

Notes: Figure 3(a) shows the distribution of plowland among the five products with the highest share in German cultivation area (rye, oats, potatoes, wheat, and barley). Figure 3(b) shows the import values for these five crops from Argentina, Canada, and the US (there were no potatoes imported from these countries). *Sources*: See Appendix A.

The extent of the exposure to international competition of the individual farmer depended on the local crop mix. As others, we exploit this fact by combining the local shares with a national-level shift variable (Rajan and Ramcharan, 2015; Bräuer and Kersting, 2024). In particular, we calculate the following import shock for each county i in the spirit of Autor et al. (2013):

$$\textit{Import shock}_i = \sum_s \frac{Area_{i,s,1925}}{Area_{s,1925}} \times \frac{\sum_{1925}^{1927} M_s}{L_{i,1925}}, \tag{2}$$

where M_s are total national imports of crop s from Argentina, Canada, and the United States (in 1925 prices). As discussed above, the productivity developments in these countries were exogenous to the German economy. We apportion these totals by the local $Area$ of crop s in county i relative to the national $Area$ of crop s. We divide this share by the number of workers L_i and sum over all crops. This yields the average exposure in Reichsmark for a worker within a county, whether or not they work in agriculture. Our data sources are standard government publications (census and trade statistics) that we harmonize over time.[10] We cover 18 products that account for 75% of German plowland.[11]

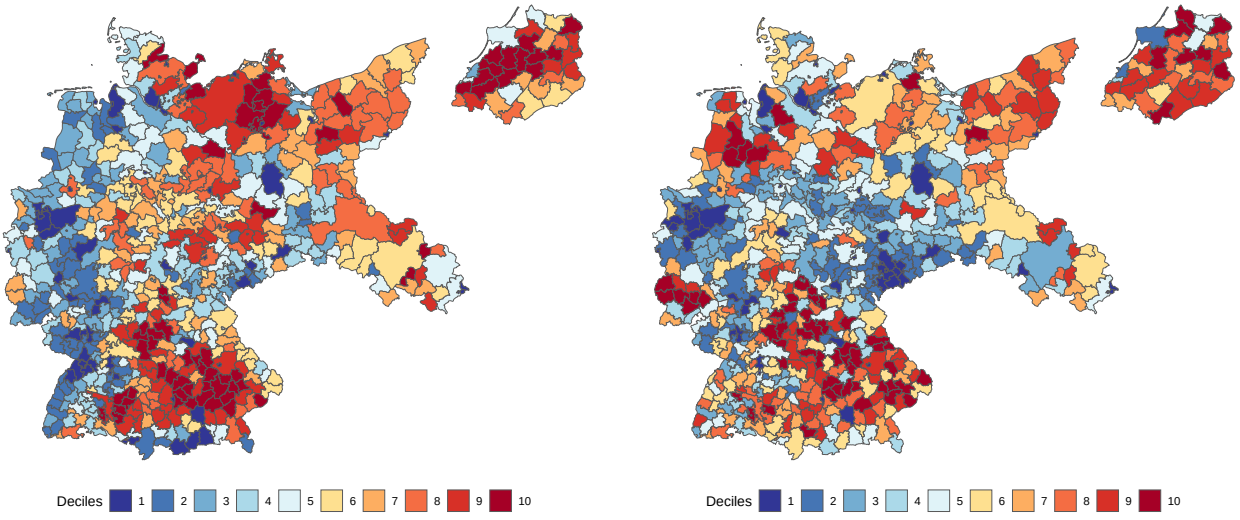
Note that we depart from the original formulation by Autor et al. (2013) in three ways. First, we use area shares instead of employment shares as data on employment by crop is not

were generally smaller by an order of magnitude and exhibit no particular trend over the period (in contrast to the pattern found for Spain during the Great Depression in Betrán and Huberman, 2024).

[10]See Appendix A for detailed sources, Appendix B.1 for consistency over time, and Appendix B.2 for further information on county-level data.

[11]See Appendix Table A.1 for details on the harmonization between census and trade data. The remaining 25% are mainly subsistence farms under five hectares, arable pasture for livestock, and fallow land.

Figure 4: Spatial distribution of key variables, 1925-1927



(a) Import shock, 1925-1927

(b) Agricultural employment, 1925

Notes: Both figures are divided in deciles. Figure 4(a) documents the import shock. Figure 4(b) documents the employment share in agriculture in 1925. *Sources*: See Appendix A.

available. Second, we sum imports over a three-year period rather than taking a particular year. Idiosyncratic weather shocks are important for the harvest and including three years rather than one year strikes us as a better reflection of the experienced shock. Third, we simply sum the imports over this period rather than calculating a change. The reason is that in our baseline period, there was virtually no trade exposure as discussed above. For ease of interpretation, we employ the logarithm of the trade shock as our variable of interest in the following regression analyses.

Figure 4(a) visualizes the resulting spatial pattern of the trade shock in Weimar Germany, with the color scheme reflecting equally sized bins ranging from low (dark blue) to high (dark red) exposure. At the macro-level, counties in the south (Bavaria and Wurttemberg) and northeast (East Prussia, Pomerania) were most affected by the growing trade exposure. However, there is considerable variation across and within smaller regions. Figure 4(b) highlights that the trade shock does not mechanically reflect different levels of agricultural employment. For example, the counties in the northwestern part were among those with the highest share in agricultural employment while facing only little exposure to grain imports. Conversely, the agricultural regions in the east suffer a high exposure.[12]

To establish the economic consequences of the 'second grain invasion' on farmers, we

[12]Appendix Figure C.2 shows the average shock exposure for the five most imported products, further emphasizing the variation *within* the agricultural sector.

gather data on debt uptake, incomes, and migration. To capture the accumulation of new debts after the war, we rely on two sources. A parliamentary inquiry into the indebtedness of German farmers collected data at the level of German tax offices on the debt stock of agricultural firms in its purview on January 1, 1928 (Enquete Commission, 1930). We match the tax office data to our county data. Hence, let us denote the absolute debt in county i at the end of 1927 as $D^{\text{All}}_{i,1927}$. To correct for the fact that these debts contain the re-instated debt discussed in Section 2.2, we leverage the combination of regional data on the share of revalued mortgages in the total agricultural debt by farm size in July 1927 (Deutsche Rentenbank-Kreditanstalt, 1929) and the known local structure of farm sizes in a given county (Statistisches Reichsamt, 1929b). The source also reports changes in the share of re-instated debt over the period 1925-1927, such that it is possible to calculate the initial level of reinstated debt in 1925 ($D^{\text{Reinstated}}_{i,1925}$). Appendix B.3 provides details and a formal representation of the corresponding calculations. Finally, $D^{\text{New}}_{i,1927} = D^{\text{All}}_{i,1927} - D^{\text{Reinstated}}_{i,1925}$ yields the absolute newly acquired debt in county i. For ease of interpretation, we normalize this value by population N_i in 1925 and take logarithms such that $ln(d^{\text{New}}_i) = ln(D^{\text{New}}_{i,1927}/L_{i,1925})$ is our variable of interest.[13] It is important to point out that this variable effectively presents a change as the initial debt after the hyperinflation was zero. We exclude the re-instated debt for argumentative reasons, but it has no qualitative effect on the results (see columns 3 and 4 in Appendix Table C.1). Additionally, we construct data on income changes and use—in the absence of census data for the exact time frame of interest—the change in eligible voters as a proxy for migration (see Appendices B.3 and A.4).

To investigate these outcomes, we use a 2SLS approach. In the spirit of Autor et al. (2013), we construct an instrument for the import shock by using US export data to the rest of the world (everywhere but Europe and North America) rather than actual German imports (while maintaining the respective area shares from equation 6). This helps us to leverage arguably exogenous variation in the shifting variable. First, these exports, which were attributed to better technology and expansion of productive capacity (Federico, 2005), are arguably exogenous to demand shocks in Germany (and the North Atlantic trade block in general). Second, the instrument is also exogenous to changes in trade policy in Germany. In particular, we estimate the following equation:

$$\begin{aligned} \text{Outcome}_{i,t} &= \alpha + \beta_1 \widehat{\text{Import shock}}_{i,1925-1927} + \beta_r \text{Region}_i + X_i'\beta + \epsilon_i \\ \text{Import shock}_{i,1925-1927} &= \alpha + \beta_1 \text{US exports RoW}_{i,1925-1927} + \beta_r \text{Region}_i + X_i'\beta + \epsilon_i, \end{aligned} \tag{3}$$

where $\text{Outcome}_{i,t}$ is either income, debt, or migration at the end of 1927. Our vector of controls X_i' includes the share of agricultural employment, the share of Protestants, and the vote share for Hindenburg in 1925. The latter two of these controls are important for the interpretation of our later regression on the political outcome and we include them here for

[13] Appendix Table C.1 columns 1 and 2 show that we can alternatively normalize by assets in 1927.

consistency. We include agricultural employment to ensure that we do not capture some general differences between more and less agricultural counties. In our most demanding specification, we include constituency fixed effects (Region_i; 35 in total) because political mobilization was organized at this level. Given our focus on the agricultural crisis and rural electorate, we restrict the sample to include only counties with above median agricultural employment share (37.9%). We cluster at the district level as we assign the areas for specific crops based on district-level data and errors are bound to be correlated at this level.

Table 1: Response to import competition: Income, debt, and migration

Panel 1: OLS	Change in income (ΔlnY_i)		ln (New debt p.c.) $ln(d_i^{\text{New}})$		Δ Number of voters (in %)	
	(1)	(2)	(3)	(4)	(5)	(6)
Import shock (in log)	-0.238***	-0.125**	0.865***	0.680***	-1.427**	-0.680*
	(0.074)	(0.055)	(0.130)	(0.124)	(0.554)	(0.404)
Mean dependent variable	-0.07	-0.07	4.82	4.82	1.82	1.82
SD dependent variable	0.46	0.46	1.06	1.06	3.38	3.38
Controls	✓	✓	✓	✓	✓	✓
Constituency FE		✓		✓		✓
R-squared	0.20	0.49	0.46	0.78	0.25	0.45
Observations	313	313	313	313	313	313

Panel 2: Second stage	Change in income (ΔlnY_i)		ln (New debt p.c.) $ln(d_i^{\text{New}})$		Δ Number of voters (in %)	
	(1)	(2)	(3)	(4)	(5)	(6)
Import shock (in log)	-0.218***	-0.152***	0.660***	0.661***	-1.366**	-0.726*
	(0.073)	(0.057)	(0.134)	(0.112)	(0.534)	(0.390)
Mean dependent variable	-0.07	-0.07	4.82	4.82	1.82	1.82
SD dependent variable	0.46	0.46	1.06	1.06	3.38	3.38
Controls	✓	✓	✓	✓	✓	✓
Constituency FE		✓		✓		✓
First stage F	345.12	632.68	358.67	672.41	358.67	672.41
Observations	313	313	313	313	313	313

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, and share of Hindenburg vote, all in 1925. Income regressions in columns 1 and 2 additionally control for forestry area (in log). Sample is restricted to above median agricultural employment share.

All three variables show substantial variation across and within relatively small regions (Appendix Figure C.3 provides corresponding maps). Following our discussion about the predicament of farmers in the previous section, we would expect that higher exposure to foreign competition led to lower incomes for farmers and that they substituted for income shortfalls with new debts. If farm laborers adjusted by migrating, we would expect a de-

crease in the number of eligible voters in affected areas.[14] Table 1 panel 1 reports the results of the corresponding county-level OLS regressions, adding a set of controls including the agricultural employment share and the share of protestants.[15] Panel 2 of Table 1 shows the results of the 2SLS regression. Our preferred specifications in columns 2, 4, and 6 of each panel also include a set of 35 regional (constituency) fixed effects.

The coefficient in column 2 of Table 1 panel 2 suggests that a 1 SD increase in the import shock decreased the growth of farm incomes by 24% of 1 SD per year. To compensate for these income losses, farmers took up debt: A 1 SD higher import shock led to an increase of 46% of 1 SD in new debt per capita over a three-year period (column 4).[16] This implies that income losses were substituted with debt uptake. Another option, especially for large farms, was to lay off their laborers. Consistent with such a crisis response mechanism, we find that a 1 SD increase in the shock led to 16% of 1 SD in the net change of voters.[17]

In sum, the import competition shock decreased farm incomes. Owners responded by taking up debt while workers seem to have, at least in part, migrated. Importantly, the exposure to import competition explains substantial parts of the cross-sectional distribution of new debts. We now turn to the political consequences of this debt accumulation.

3.2 Debt, politics, and discontent

To elicit the discontent with the parliamentary system, we rely on an anti-system referendum in 1929. In particular, the leader of the traditionally national-conservative DNVP Alfred Hugenberg and the NSDAP with Hitler led an initiative for a referendum against reparations in 1929. The official title "Against the enslavement of the German people (freedom law)" ("*Gegen die Versklavung des Deutschen Volkes (Freiheitsgesetz)*") already conveys the central message: The government's agreement to the Young Plan had betrayed the German people by acknowledging guilt for the war and therefore reparation debt. According to the proposed law, any such acknowledgment would be considered treason and punishable by imprisonment. While it was framed in general terms, the proposal particularly resonated in rural areas where frustration with the government was already high and debt was a salient topic (Angress, 1959). Even though the referendum finally failed, it was worthwhile for the

[14]Note that we normalize the new debt by population in 1925 to account for an endogenous migration response.

[15]To account for the fact the income statistics (Statistisches Reichsamt, 1929a, 1931) also contain income from forestry whereas as the debt data (Enquete Commission, 1930) and our shock reflect *agricultural* activities only, we additionally control for forestry areas (in log) in columns 1 and 2 of Table 1.

[16]Note that exposure to import competition alone explains 40% of the cross-sectional variation in debt uptake.

[17]Given that we use the number of voters, these estimates are unlikely to reflect differential birth rates. They might, however, stem from increased death rates or out-migration. A migration response might be a concern for the analysis of the political consequences in the case of selective migration. In our study, however, there are two potential directions of the bias: On the one hand, workers with a more liberal political view might be more likely to migrate. On the other hand, workers most strongly affected by the shock might migrate more often. The latter would form a selection against our findings.

NSDAP which left the campaign as the "most prominent and aggressive voice of the anti-republican right" (Childers, 2017, p. 107). Hence, we use the share of signatures per eligible voter for the Young referendum in 1929 as an ideal proxy of political discontent. We use the signatures because of the timing of their collection in October 1929 before the US and European stock market crashes.[18] In addition, we use electoral support for the NSDAP in 1928 as a complementary indicator. However, it is important to note that the total vote share of the (previously banned) NSDAP only amounted to around 2% and that the degree of organization and campaigning varied substantially (Stachura, 1978; Grill, 1982). We hence consider the share of referendum signatures per eligible voter a more reliable indicator.

Using the *share of signatures* or *vote share for the NSDAP* as outcomes, we employ the same main specification as for the economic effects (equation 3), again with additional controls for constituency fixed effects and start-of-period variables X_i. In particular, we add Protestantism and the vote share for Hindenburg in the presidential election in 1925 as controls. The vote for Paul von Hindenburg—the opposition candidate against the Weimar coalition's candidate Wilhelm Marx— is an indicator of anti-republican sentiment before the shock. Moreover, as previous research has shown (Spenkuch and Tillmann, 2018), Protestantism is a crucial predictor for the success of the NSDAP. As before, we cluster at the district level.

Table 2: Political effect of debt uptake

Dep. var.	Signatures referendum (in %)			NSDAP vote share 1928 (in %)		
	OLS		Second Stage	OLS		Second Stage
	(1)	(2)	(3)	(4)	(5)	(6)
New debt p.c. (in log)	2.179***			0.324		
	(0.686)			(0.217)		
Import shock (in log)		1.731**	1.872***		0.415**	0.357*
		(0.728)	(0.703)		(0.190)	(0.190)
Mean dependent variable	15.59	15.59	15.59	1.98	1.98	1.98
SD dependent variable	15.55	15.55	15.55	2.46	2.46	2.46
Constituency FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
First stage F			672.41			672.41
R-squared	0.86	0.85		0.45	0.45	
Observations	313	313	313	313	313	313

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, and share of Hindenburg vote, all in 1925. Sample is restricted to above median agricultural employment share.

Table 2 shows the corresponding results. We begin by reporting a strong conditional correlation between debt increase and support for the referendum in column 1. It implies that a one percent increase in debt uptake per capita is associated with an increase in the

[18] Appendix Table C.2 shows qualitatively identical alternative estimates for the share of yes-votes and turnout. Voting took place in December 1929.

support for the referendum of 2.2 percentage points. Leveraging the import shock as an exogenous driver of debt, we find overall a strong positive impact of the import shock on the *the share of signatures* for the referendum, both in the OLS and 2SLS regressions (columns 2 and 3) with the IV coefficient being only slightly larger than the OLS estimate. Substantially, the coefficient of our preferred estimation in column 3 implies that an increase of 1 SD in the shock (corresponding to 0.7 log points) explains an increase of 1.4 percentage points in the signature share for the Young referendum (relative to a mean of 15.6 percentage points or 9% of 1 SD). Moving from the 10th to the 90th percentile in terms of shock exposure translates to an increase in support for the referendum of 3.4 percentage points, equivalent to almost a quarter of the average support of 15.5.

Turning to electoral support for the NSDAP in 1928, which was still a minor political party with an average vote share of about 2% in our rural sample, we observe similar patterns in columns 4 to 6 of Table 2. While the OLS coefficient-estimate of debt is insignificant, exploiting the exogenous driver of debt in columns 5 and 6, we see a positive association between the import shock and early support of the NSDAP. The IV results in column 6 correspond to a similar size in substantive terms as the results for the referendum: An increase of 1 SD in the shock explains about 10% of 1 SD in voting for the NSDAP. Again, we consider these results complementary to those for the referendum.

Our results are robust to different sample splits[19] and spatially clustered errors with different cutoffs following Colella et al. (2019) (Appendix Tables C.3 and C.4). An additional concern in our setting is the existence of pre-trends, i.e., regions with stronger exposure to import competition and higher demand for credit could have been on a more negative trajectory already before the shock (and voted accordingly). Our inclusion of the vote share for Hindenburg in 1925 as a control variable in our regressions partially mitigates this concern. As an additional exercise, we analyze the change in voting for the radical nationalist (*völkische*) parties between 1920 and May 1924. For this purpose, we add up the conservative DNVP with numerous other right-wing parties, e.g., the *Bayrische Volkspartei* and the *deutsch-soziale Partei*. Notably, for 1924 we also include the *Nationalsozialistische Freiheitspartei*, which was an electoral alliance of the—at that time banned—NSDAP and a conservative splinter group. Our results do not suggest any significant pre-trend regarding exposure to import competition and support for right-wing parties (Table 3, column 1).

To further validate our empirical approach, we have to ensure that we measure the effect of the trade shock and not structural economic decline in rural parts of Germany. It is important to note that we exploit variation *within* the agricultural sector. As with every shift-share approach, exogeneity of either the shifts (in our case US exports) or the shares (in our case local crop shares) is sufficient for identification (Borusyak et al., 2022; Goldsmith-Pinkham et al., 2020). Therefore, Table 3, column 2 explicitly controls for the crop shares to

[19] Crucially, we observe no effect in the urban sample.

Table 3: Validity of empirical approach

Dep. var.	Pre-trends Nationalist block (in %) (1)	Shift-share robustness Signatures referendum (in %) (2)	(3)
Import shock (in log)	0.533	1.673**	1.872***
	(0.789)	(0.814)	(0.703)
Mean dependent variable	39.63	15.59	15.59
SD dependent variable	16.89	15.55	15.55
Controls	✓	✓	✓
Constituency FE	✓		✓
Crop shares		✓	
First stage F	275.57	1127.23	672.41
Observations	290	313	313

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, and share of Hindenburg vote, all in 1925. Sample is restricted to above median agricultural employment share. Column 1 controls for vote share of nationalist block in 1920 as initial vote share. The lower sample size in column 1 is due to necessary aggregation of counties when including the 1920 election. In column 2, we explicitly control for local crop shares. In column 3, we report the standard errors in brackets following Adao et al. (2019).

mitigate remaining concerns that some specific local conditions correlated with those shares drive our results. This constitutes the most demanding specification in the Autor et al.-shock literature (following Borusyak et al., 2022, p. 210). An additional concern related to the local shares could be correlation in the error term across counties with similar cultivation structures independent of their geographic location. Following Adao et al. (2019), in column 3 in brackets we present standard errors that are robust to such a correlation.

In sum, our results suggest a strong causal link between economic hardship, the debt accumulation 1924-1928, and political discontent that is consistent with the historical account of the period (Section 2). Moreover, the exposure to foreign grains alone can explain a substantial amount of the cross-sectional variation in debt uptake. These varying debt levels were of significance when the second phase of the German agricultural debt crisis in the interwar period—the debt deflation—began.

4 Debt deflation and the rise of the NSDAP

While the NSDAP won not even 2% of the rural vote in the May 1928 election, it reached more than 30% in July 1932. To what extent did debt deflation contribute to these developments? Analogously to the previous section, we first establish an exposure measure to debt deflation and demonstrate its economic effects (Section 4.1). We then show that exposure to debt deflation contributed to the NSDAP's success in rural areas in a meaningful way (Section 4.2) and assess the overall effect of debt accumulation and deflation (Section 4.3).

4.1 The local exposure to debt deflation

The standard measure for debt deflation is the leverage ratio which is defined as the debt stock over either income or debt (see Section 2.1). A change in the leverage ratio relative to the pre-deflation period provides a measure of the exposure to debt deflation. We employ the ratio of debt relative to assets at the beginning of 1928 as our pre-deflation baseline. The corresponding statistics at the county level were produced as part of the parliamentary inquiry into the debt question (Enquete Commission, 1930). Our measure is defined as:

$$\widehat{\Delta Debt\ ratio}_{i,1928-1932} = \frac{\widehat{D_{i,1932}}}{\widehat{W_{i,1932}}} - \frac{D_{i,1928}}{W_{i,1928}} \tag{4}$$

Equation 4 shows that we employ a predicted rather than the actual leverage ratio for 1932. This has both data and substantive reasons. First, the number of farms, the total area, and assessment rules changed for later farm value assessments. While the data remain comparable for some counties, they are not for others (see Appendix B.5 for further details). Second, the predicted leverage ratio aims to isolate the plausibly exogenous changes in both the numerator and denominator of the debt-income ratio. Tax assessors were explicitly instructed to take local conditions such as market access and labor market conditions into account (Statistisches Reichsamt, 1939, p. 5). Thus, using the actual leverage ratio in 1932 would create endogeneity concerns. For example, local political measures to support farmers or differences in the local provision of credit would affect both the outcome of interest (the NSDAP vote) and the leverage ratio.

To construct the exogenous increase in debt, we compound the existing debt levels in 1928—the cross-sectional variation of which had been largely determined by the import shock—with an effective interest rate of 8% which we derive in Section 2.2. The resulting change in the leverage ratio induced through the liability side is simply a transformation of the initial debt level ($\widehat{D_{i,1932}} = D_{1928} \times 1.08^4$).

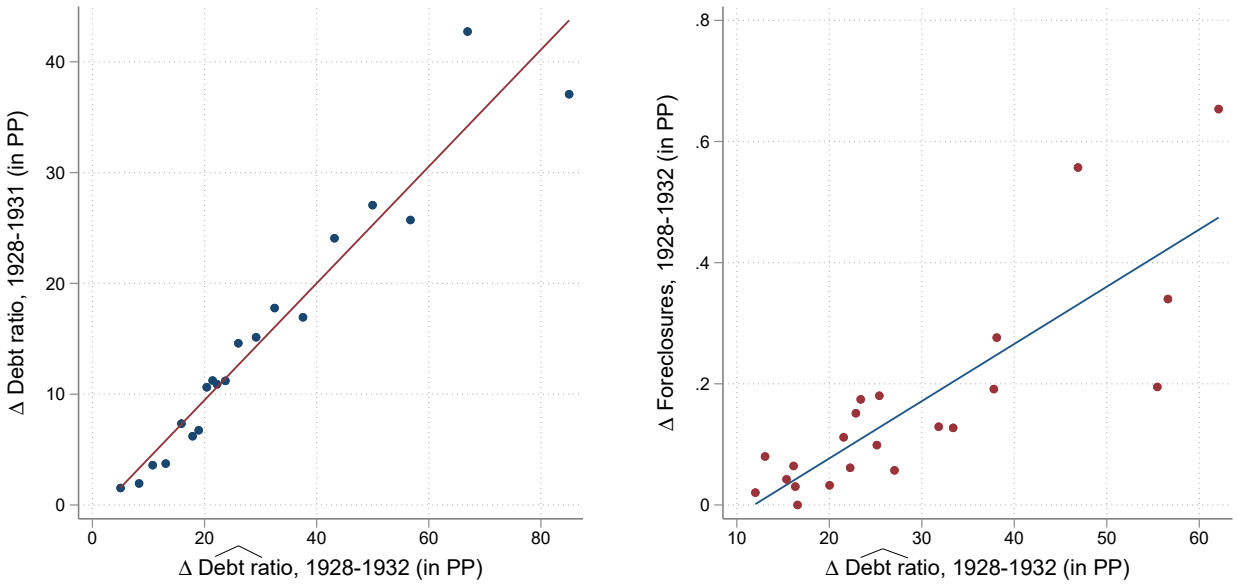
To isolate the exogenous decrease in the farm value ($\widehat{W_{i,1932}} = (1 + g^W_{i,1928-1932}) \times W_{i,1928}$), we exploit the strong relationship between agricultural land values and commodity prices. Commodity prices varied only at the national level as markets were integrated within Germany. However, as different counties grow different crops, the exposure to variations in commodity prices differs across small geographic units (Rajan and Ramcharan, 2015). Indeed, there exists a direct link between commodity prices and land values that we can exploit to calculate g^W. German authorities assessed the taxation value of land as $W_t = Y_t \cdot \chi$, where Y is the net profit—in practice largely equivalent to the income of the farmer—and $\chi = 18$ is the capitalization factor (Statistisches Reichsamt, 1930, p. 10). Note that $Y_t = \sum_s p_{i,t} q_{i,t} - c_t$ is the sum of sales v (with quantities q and price p) of produce s minus cost c. Keeping quantities and costs constant ($q_s = q_{s,0} = q_{s,1}$ and $c = c_0 = c_1$)—a reasonable approximation for this period as prices for 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 wealth between any two points in time as:

$$g^W = \frac{1}{(1-\zeta_0)} \sum_s \frac{v_{s,0}}{V_0} g_s^p, \tag{5}$$

i.e., the change in farm assets is the weighted average of price changes of commodities multiplied by the inverse of $1-\zeta$, where ζ is the share of cost in sales in t_0. Since $\zeta < 1$, the term amplifies any change in commodity prices that is capitalized into land values, reflecting the predicament that the coexistence of constant costs for inputs and falling commodity prices cause. Technically, the weights are reflected by the initial sales $v_{s,0}$ of good s in total sales V_0. When applying the formula to the data, we employ areas instead of sales for data availability reasons and set $\zeta = .5$.[20]

Figure 5: Validation of debt deflation exposure and its economic effects



(a) Predicted and observed debt deflation

(b) Predicted debt deflation and observed foreclosures

Notes: Figure 5(a) shows the relationship between our debt deflation measure using weighted commodity price changes between 1928 and 1932 and debt deflation between 1928 and 1931 derived from observed changes in debt levels and land values (both in PP) for a subset of counties with comparable data in a binned scatter plot (see Appendix B.3 for details). Figure 5(b) 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. *Sources*: Data on foreclosures from Kokotkiewicz (1932). Other data see Appendix A.

To validate our measure of debt deflation $\widehat{\Delta Debt\ ratio}_{i,1928-1932}$, Figure 5(a) compares it to a change in debt ratios derived from observed debt levels and land values as assessed

[20]To make the predicted change consistent with the tax valuation of 1928, we multiply it with the ratio of tax to market values from Albers et al. (2022). Appendices A.1 and B.4 provide the data sources and full derivation, respectively.

by the authorities (both in 1931) for a subset of 213 rural counties with usable statistics (see Appendix B.3 for details on this calculation) in a binned scatter plot with each dot representing around 15 counties. While not perfect, the relationship is strikingly strong and positive with the main difference being the generally lower values in 1931. This is partly due to timing and because taxation values should reflect long-term changes in the profitability of land and included more profitable earlier years for that reason.

To illustrate the economic impact of the exposure to debt deflation, Figure 5(b) plots it against changes in the share of foreclosed farms, which are only available on the province/state level. The strong and positive relationship underlines the harmful consequences of debt deflation. One should also keep in mind that foreclosure is the measure of last resort and that economic hardship will already have been felt beforehand.

4.2 The political consequences of debt deflation

Before 1928, the NSDAP had not targeted the rural electorate in a centrally organized way. If there was any at all, campaigning in the countryside was driven by local or regional initiatives, and its messaging was, ironically, mainly influenced by the party's left-wing under Gregor Strasser (Grill, 1982). In the run-up to the 1928 election, Hitler addressed rural voters for the first time officially by amending the contentious *Point Seventeen* of the party's program from 1920. While it had originally stated that the party would not accept any land ownership as private property and favored expropriation, he now declared it to always have referred only to land owned by Jewish speculators (Stachura, 1978). Observing the amount of discontent expressed as electoral support for the party in 1928 and, in particular, for the Young referendum in 1929 as discussed in Section 3.2, the NSDAP began to target rural voters more strategically (Ziemann, 2022, p. 513). It was in March 1930 that the NSDAP put forward their agricultural program, drafted by Walther Darré and offering protectionism, measures for debt relief, and support for agricultural laborers. This message was even more pronounced in 1932. Next to the political program, Darré recruited local advisors in every rural county to report back on optimal messaging as well as to implement ideological instruction coming from the party's central office. In addition, Darré's agricultural policy apparatus (*agrarpolitischer Apparat*) attempted to infiltrate existing agricultural pressure and interest groups (Gies, 2019). The fact that the disastrous economic situation of agriculture was closely connected to debt, interest payments, and foreclosures also provided the Nazi party with ample opportunities for anti-Semitic propaganda. To what extent was the NSDAP successful in unifying the rural protest vote?

We confront this question by estimating the following first difference specification:

$$\Delta \textit{Vote share}_{i,1928-1932} = \alpha + \beta_1 \Delta \widehat{\textit{Debt ratio}}_{i,1928-1932} + \sum \beta X_{i,t} + \epsilon_i. \tag{6}$$

where $\Delta \textit{Vote share}_{i,1928-1932}$ is the change in votes for either the NSDAP or a group of par-

ties that we call 'farmers parties' as they catered predominantly to farmers. Some of those ran across Germany, such as the DNVP, while others were regional or local, such as the *Bayerischer Bauernbund* in Bavaria.[21] 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, and turnout. $\widehat{\Delta Debt\ ratio}_{i,1928-1932}$ is the change in the leverage ratio, i.e., our measure of exposure to debt deflation.[22] In addition, we include several initial-level control variables $X_{i,t}$ like employment share in agriculture, the share of Protestants, the initial support (in levels) of the relevant party or party grouping, and constituency fixed effects to capture their varying effects over time.

Table 4: Effect of debt ratio on political support

Dep. var.	Δ Vote Share, 1928-32					
	NSDAP	Farmers'	Weimar	KPD	Other	Turnout
	(1)	(2)	(3)	(4)	(5)	(6)
$\widehat{\Delta Debt\ ratio}$, 1928-1932	0.132***	-0.063**	-0.025	-0.011	-0.014	0.039
	(0.048)	(0.025)	(0.028)	(0.018)	(0.009)	(0.034)
Mean dependent variable	30.30	-15.73	-2.11	2.94	-6.51	8.89
SD dependent variable	14.56	8.57	5.56	1.91	4.63	7.33
Controls	✓	✓	✓	✓	✓	✓
Constituency FE	✓	✓	✓	✓	✓	✓
R-squared	0.88	0.92	0.67	0.33	0.95	0.79
Observations	313	313	313	313	313	313

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, and initial vote share. Sample is restricted to above median agricultural employment share.

Table 4 reports the corresponding results. The Nazi party was able to gain substantially more support in counties that were affected by higher debt deflation (column 1), whereas more traditional farmers' parties took stronger losses in the same areas (column 2). The coefficient of interest in column 1 implies that a one percentage point increase in the debt ratio leads to a 0.13 percentage point increase in vote share for the NSDAP. In substantive terms, 1 SD in the debt ratio increase explains 17.5% of 1 SD in the change of votes for the NSDAP corresponding to 2.5 percentage points.

The flip side of the NSDAP's gains were the losses of the farmers' parties shown in column 2. While the coefficient is roughly half the size of the one for the Nazi party, in terms of the effect size they are comparable: 1 SD in the debt deflation explains 14.3% 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,

[21] 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 (1933). See Appendix A.4 for details.

[22] See Appendix Figure C.4 for the geographic distribution of our main variables.

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 suggest that the NSDAP seemed like the last viable option, since the farmers' parties, like the conservative DNVP, were not able to improve the economic situation of their traditional constituency (see the discussion in Section 2.4).

The counter-argument to our causal interpretation of these effects would be other time-varying shocks that correlate with our debt deflation measure and affect voting. In the numerator, one concern might be debt relief, specifically in the form of *Osthilfe* as discussed in Section 2.4. We tackle this concern in two ways in Appendix Table C.9. First, we introduce a dummy variable capturing the county-level roll-out of this aid program as an additional control in column 2.[23] Second, we further control for the share of estates (farms larger than 100 hectares) in column 3 as those profited most from the aid program and have often been discussed as associated with right-wing voting in the literature. In both cases, our coefficient estimates are unaffected. Regarding the weighted price change in the denominator, county-level agricultural structure might be a concern if there were targeted subsidies not reflected in the commodity prices. In addition to our regional fixed effects, we mitigate this further by allowing for a time-varying effect of specialization in crop cultivation (relative to animal production) in column 4 of Appendix Table C.9. Again, our coefficient estimate remains stable.

In additional robustness tests, 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.6).[24] They are also robust against different sample splits[25] (Appendix Table C.5) as well as spatially clustered standard errors following Colella et al. (2019) (Appendix Table C.7). Importantly, these results are unlikely to be tainted by migration. Contrary to our investigation of the import shock, we find no migration response to debt deflation (Appendix Table C.8). Given the increase in unemployment during the Great Depression also in cities, this is in line with our expectations.

4.3 Combined effect of debt accumulation and deflation

To gauge the total effect of debt accumulation and deflation on voting, we construct a hypothetical scenario without the debt accumulation and deflation crises. For this scenario, let us assume that rather than taking up substantial debt to refinance old debt, the government

[23] 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). Before then, aid was only accessible in the province of Eastern Prussia, which we capture with our fixed effects.

[24] The same table also shows that there is no significant effect of debt deflation on the September 1930 election. This is plausible given 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.

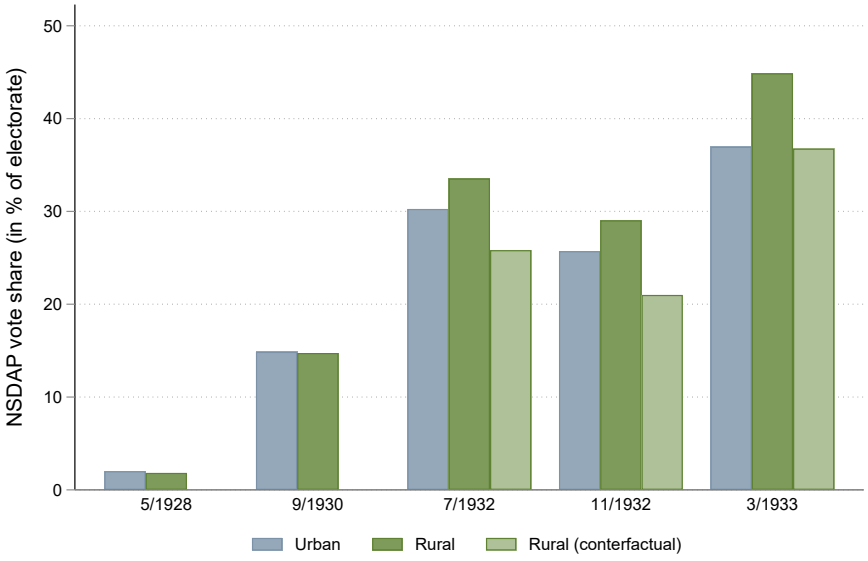
[25] As before, we do not find an effect in the urban sample.

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), which corresponds well to our aggregated primary deficits estimated in Section 2.1. This still implies a significant debt uptake between 1923 and 1928, corresponding to a leverage ratio of 35% using the sector's income as the denominator. Analogously to our estimates in Section 2.3, we project this reduced debt stock forward, assuming again an interest rate of 8% resulting in a lower numerator of the debt ratio. We then conjecture that commodity prices had not fallen, for example, because Germany left the gold standard. In consequence, farm values (in the denominator) would have remained constant. The formal description of the counterfactual is denoted as:

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

Taken together, our two assumptions yield a hypothetical debt ratio in 1932 with a population-weighted average 54 percentage points below the ratio used in our previous analysis. Multiplying this difference with our preferred estimate shown in Table 4, column 1 suggests a decline in the average vote share for the NSDAP by 8.2 percentage points in July 1932 and even slightly larger declines in the two subsequent elections.

Figure 6: Aggregated effects of rural debt deflation on voting



Notes: Figure 6 shows the NSDAP vote share in urban and rural areas as well as the counterfactual vote share for the NSDAP without debt deflation. Rural counties are defined by a median sample split (below/above agricultural employment share of 37.9%). *Sources*: Actual election data from Falter and Hänisch (1990). For the calculation of the counterfactual voting outcomes, see text.

Figure 6 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. In the earlier elections, the party achieved (slightly) stronger 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 more support in rural counties by a margin of multiple percentage points in all subsequent elections. Yet, in our counterfactual situation in which farmers and rural communities were much less exposed to debt deflation and its harmful consequences, the rural NSDAP vote share would have remained below its urban counterpart in all elections.

Finally, 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 rural counties, (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 urban counties. Note that our calculation implies *no* changes in counties with an agricultural employment share below 37.9%, a very conservative assumption.[26] This exercise yields a hypothetical vote share of 35.07% for the NSDAP in the July 1932 election. This decline of more than 2.2 percentage points compared to the actual support would have been sufficient to allow other parties to form a majority coalition against the NSDAP and the Communist party, showcasing the political relevance of the joint economic shocks. From this vantage point, debt deflation was a necessary condition for the Nazi party's ascension to power.

5 Conclusion

The indirect effects of the war, including the limited investment and breakdown of credit markets, coupled with limited tariff protection after World War I led to a fast debt uptake and growing political discontent among German farmers. Our analysis demonstrates that the subsequent process of debt deflation in rural Germany was one of many necessary conditions that facilitated the rise of the Nazis. We argue that a devaluation of the currency and reflation of price levels was the only conceivable way out of the debt deflation. Whether or not then-chancellor Brüning did indeed have the 'room to maneuver' (see the Borchardt debate) is an interesting question, but it should not blur the lessons that can be learned from this period. The political and economic costs of deflationary monetary policy are enormous as the case of interwar Germany reminds us.

[26] 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 4.

Future research should investigate how important the link between debt deflation and political radicalization is beyond our specific case of the German agricultural sector. First, it is conceivable that debt deflation also affected the political leanings of the mortgage-holding urban middle class as well as over-leveraged business owners. During the 1930s, these two groups voted over-proportionally for the NSDAP (Falter, 1991). There are two typical explanations for the difference from the voting patterns of unemployed workers, who supported the Communists. First, this group was generally more conservative and owned assets. Thus the radical program of the Communists had little appeal for them. Second, they moved away from more centrist alternatives, not because of unemployment, but because of the fear of status loss . An analogous analysis to ours for the urban electorate could clarify whether this 'fear of status loss' had a strong economic underpinning.

Beyond examining the German case, our results highlight the importance of unpacking the channels through which economic and financial crises affect voting. While the degree of correlation is well documented for the interwar period and the 20th century more generally (De Bromhead et al., 2013; Funke et al., 2016), the precise mechanisms—with few exceptions such as Doerr et al. (2022) and there-cited literature—are less well identified. However, for the interpretation of the crisis-radicalization nexus, it matters whether decreases in income, unemployment, banking crises, or debt deflation cause radical voting. As underlying reasons differ, so do the policy prescriptions. Particularly when faced with harsh trade-offs under crisis constraints identifying the most vulnerable groups and implementing efficient policies is vital.

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Online Appendix
Losing the country: Debt, deflation, and the rural rise of the Nazi part

A Data and sources

A.1 Debt decomposition

Debt and effective interest

- Sources:
  - For the debt stock:
    End of year values are from Kokotkiewicz (1932, p. 22)
    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.

Agricultural income and real growth rate

- Source: Fremdling (2010); Statistisches Reichsamt (1935, 1938)
- Description: Fremdling (2010) provides a benchmark for net value added of the agricultural sector for 1936. We employ the contemporary official sectoral national income estimates to extrapolate backwards the income (Statistisches Reichsamt, 1935, 1938). For 1924, no income data exist such that we use the changes in sales from Kokotkiewicz (1932, p. 22) to impute the income for 1924.[1]
- The real growth rate is calculated as the change in real incomes.

Inflation

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

[1]Note that the official sectoral national account estimate combines incomes for agriculture and forestry. We use the net production estimates from Lange (1932, p. 561) to correct for this. Also note that, we have no income data for 1923. However, the debt-income ratio was 0 by definition in this year as the numerator (debt) was 0.

A.2 International trade

German trade statistics

- Sources: Statistisches Reichsamt (1925a, 1927, 1928a)
- Product-level country-specific imports and exports. List of included products see Appendix Table A.1.
- Deflated with the series by Ritschl and Spoerer (1997).
- Years: 1924-1927

US trade statistics

- Sources: Bureau of Foreign and Domestic Commerce (1925, 1926, 1927)
- Product-level region-specific exports. List of included products see Appendix Table A.1.
- Deflated with the series by Johnston and Williamson (2023).
- Years: 1925-1927

German price data

- Sources: Statistisches Reichsamt (1933b), Hanau and Plate (1975)
- Product-level prices for crops and livestock. List of included products see see Appendix Table A.1.
- Years: 1928-1932

A.3 Agricultural sector

Agricultural debt

- Sources: Deutsche Rentenbank-Kreditanstalt (1929),Enquete Commission (1930),Deutsche Rentenbank-Kreditanstalt (1932)
- Debt of agricultural firms (over 5ha) in RM as of 01.01.1928 and corresponding tax values, regional agricultural debt and reinstated debt by farm size in 1928 and 1931
- Units:
  - Enquete Commission (1930): tax office (aggregated to fit time consistent counties)
  - Deutsche Rentenbank-Kreditanstalt (1929) and Deutsche Rentenbank-Kreditanstalt (1932): seven regions (Eastern Prussia, Silesia, Northern Germany, Northwestern Germany, Central Germany, Southwestern Germany, Bavaria)
- Years: 1928, 1931

Agricultural wealth

- Sources: Statistisches Reichsamt (1930), Enquete Commission (1930), Statistisches Reichsamt (1939)
- Tax values as of 01.01.1925, debt of agricultural firms (over 5ha) in RM as of 01.01.1928 and corresponding tax values, and tax values as of 01.01.1931
- Units:
  - Statistisches Reichsamt (1930) and Enquete Commission (1930): tax office (aggregated to fit time consistent counties)
  - Statistisches Reichsamt (1939): county
- Years: 1925, 1928, 1931

Agricultural income

- Sources: Statistisches Reichsamt (1929a), Statistisches Reichsamt (1931), Statistisches Reichsamt (1931b)
- Income of agricultural firms over 5ha in RM
- Unit: tax office (aggregated to fit time consistent counties)
- Years: 1925-1927

Agriculture census: Local crop shares

- Sources: Statistisches Reichsamt (1928c, 1929b)
- Units:
  - Statistisches Reichsamt (1928c): district

  - Statistisches Reichsamt (1929b): county
  - Both dis-aggregated by farm size
- Year: 1925

Agriculture census: Livestock

- Source: Statistisches Reichsamt (1929b)
- Unit: county
- Year: 1925

Agriculture and trade data harmonization

- See Appendix Table A.1

Table A.1: Product harmonization

Agricultural Census 1925: "Ackerland"	**German trade data: "A. Erzeugnisse des Acker-, Garten- und Wiesenbaues"**	**US trade data**	**German market prices**
Roggen (5)	1. Roggen	rye	Roggen
Weizen, Spelz, Emer, Einkorn (4)	2a. Weizen 2b. Spelz	wheat	Weizen
Gemenge aus Weizen und Rogggen auch Spelz, Emer, Einkorn (6)			
Gerste (7)	3a. Gerste zur Viehfütterung 3b. Andere Gerste	barley	Gerste
Hafer (8)	4. Hafer	oats	Hafer
Sonstiges Getreide (Buchweizen, Hirse usw.) (10)	5. Buchweizen 6. Hirse		
Erbsen, Bohnen, Linsen in feldmäßigem Anbau (13)	11a. Speisebohnen 11b. Erbsen 11e. Linsen	dried beans dried peas	Bohnen Erbsen
Lupinen (12)	12b. Lupinen		
Wicken und andere Hülsenfrüchte in feldmäßigem Anbau (14)	12c. Wicken		
Andere Handelsgewächse	13b. Dotter, Ölrettich-, Hederichsaat 13c. Senf		
Kartoffeln (16)	23. Kartoffeln	potatoes	Kartoffeln
Zuckerrüben (17)	25a. Zuckerrüben, frisch 25b. Zuckerrüben, getrocknet		Zuckerrüben
Flachs und Hanf (20)	28d. Flachs (gebrochen, geschwungen, entleimt, gereinigt) 28e. Hanf		
Gemüse in feldmäßigem Anbau (23)	33a.-33v. Küchengewächse einzeln		
Mais (9)	7. Mais, Dari	corn	
Futterrüben, Runkelrüben, Möhren, Hackfrüchte (18)	12a. Futterbohnen 24. Futterrüben		Mohrrüben Kohlrüben
Ölfrüchte (Raps, Rüben, Mohn usw.) (19)	13a. Raps, Rübsen 14a.1. Mohn 15a. Leinsaat, Leinmehl		
Futterpflanzen (Klee und Gras aller Art) (25)	27a. Grünfutter, Heu, Spreu, Häcksel	hay cottonseed cake linseed cake	Heu
			Rindvieh Schweine Schafe

Notes: Sources in order; for the agricultural census: Statistisches Reichsamt (1928c, 1929b), for the German trade data: Statistisches Reichsamt (1927, 1928a); for the US trade data: Bureau of Foreign and Domestic Commerce (1925, 1926, 1927); for the German price data: Statistisches Reichsamt (1933b).

A.4 Election results

Reichspräsident election

- Source: Statistisches Reichsamt (1925b)
- Population as of 1919; eligible voters; votes in second round for Hindenburg, Marx, Thälmann
- Unit: county
- Year: 1925

Young referendum

- Source: Statistisches Reichsamt (1928b)
- Population as of 1925; eligible voters; number of signatures; number of yes/no votes
- Unit: county
- Year: 1929

Reichstag elections

- Sources: Falter and Hänisch (1990), Statistisches Reichsamt (1933)
- Unit: county, i.e., aggregation levels 4, 5, and 6 in Falter and Hänisch (1990)
- Years: 1920-1933
- 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*
  - 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). For this reason, including constituency fixed effects is 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.5 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; Protestants

B Data construction

B.1 Aggregation

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 1924 and 1933 (and additionally between 1920 and 1924 for the pre-trend analysis in Table 3)[2], a period which 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, 1929b) 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 1924 to 1933.

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

Unfortunately, many such reforms just shifted municipalities from one county to the other. 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 than other studies that only start their analyses in 1928 or later.

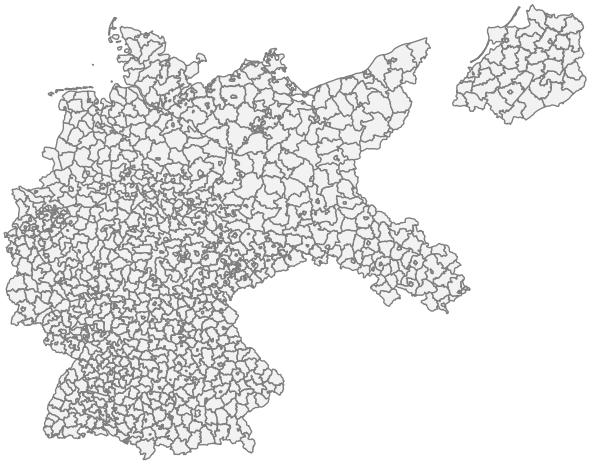
In addition, we further have to account for tax offices. Here, we proceed similarly to the procedure described above. First, wherever possible, we relate tax offices to counties by name and check whether the office is indeed responsible for all of the county relying on Rademacher (2008).[4] If a tax 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 two or more tax offices are responsible for different parts of the same county, we simply aggregate and match them to that county. Second, if the purview of one tax office contains multiple counties, we aggregate those counties, unfortunately necessitating a further decrease in our number of observations.

[2]This further decreases the number of observations substantially which is why we use this sample for the pre-trends only.

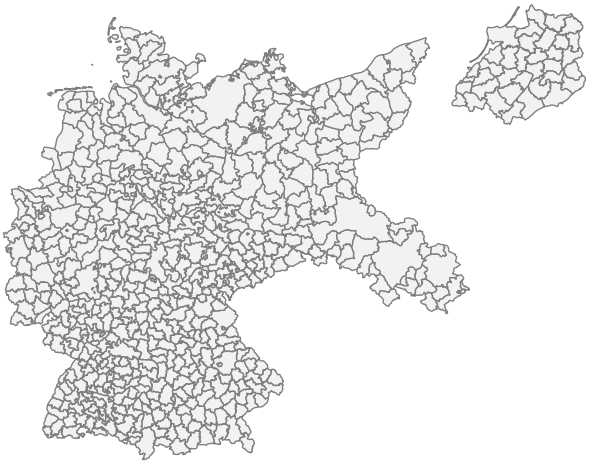
[3]We are grateful to Alexander Wulfers who provided this step based on his dissertation, which we expand upon to include tax offices and the 1920 election.

[4]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.

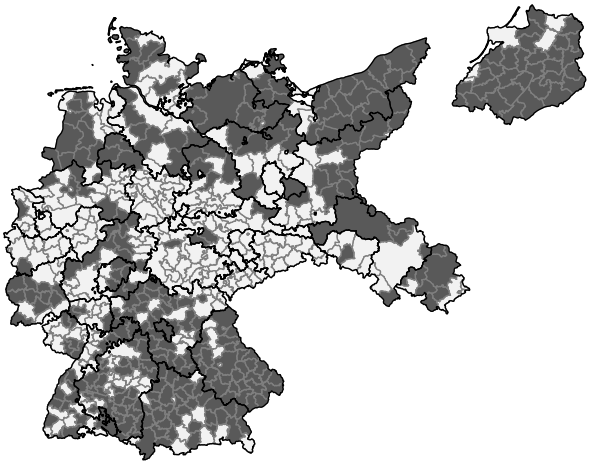
Figure B.1: Data overview



(a) MPIDR, 1925



(b) Aggregated counties, 1924-1933



(c) Rural sample and constituencies

Notes: Figure 1(a) shows the map of the German Empire in 1925 provided by Max Planck Institute for Demographic Research and Chair for Geodesy and Geoinformatics, University of Rostock (2011). Figure 1(b) documents the aggregation necessary to construct time-consistent units, 1924-1933. Figure 1(c) shows our rural sample (dark gray) and the borders of the 35 constituencies (black).

Appendix Figure B.1 documents the data aggregation. Appendix Figure 1(a) 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 1(b) 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. Overall, the number of observations decreased from 1,029 in Max Planck Institute for Demographic Research and Chair for Geodesy and Geoinformatics, University of Rostock (2011) to 636 in our data set. Appendix Figure 1(c) further shows counties with above median employment share in agriculture—which make up the basis of our main analysis—and indicates the boundaries of the 35 constituencies 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), thus resulting in 313 observations in the main analysis.

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, 1928c, 1929b). Statistisches Reichsamt (1928c) contains district-level data on the cultivation area by crop and farm size category. Statistisches Reichsamt (1929b) 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 (1928c, 1929b) in Ar ($10m \times 10m$) and Ha ($100m \times 100m$) are smaller 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. For more details on the crops, see Appendix Table A.1.

B.3 Income and debt, 1925-1928

Income There is no income data available for the periods of war, emergency economy, and hyperinflation. However, we approximate the income growth rate relative to past incomes in county i by taking advantage of the fact that in agriculture, the valuation of assets for tax purposes relied on the capitalization method. At micro-regions, the profits of typical farms were calculated and then capitalized with factor 18. The profits were taken as an average of 'normal' past years—trying to reflect the sustainable profit of a given farm business. Hence, we define the expected income at the end of 1924 based on past values, presumably taken from pre-war years as

$$\widehat{Y_{1924}} = 1.1\frac{W^T_{1925}}{18}$$

where W^T_{1925} is the tax value in Statistisches Reichsamt (1930). Note that we apply an uprate factor of 1.1 to account for minor differences in the calculation of farm profits and the income concept of the income tax (e.g., accounting for the cost of labor of the farm owner, treatments of debt).

For the income during the years 1925-1927, we can rely on the income tax statistics (Statistisches Reichsamt, 1929a, 1931) and denote $\overline{Y_{1925-1927}}$ as the average income over these years in 1925 Reichsmark values. We thus approximate the growth rate relative to past incomes in county i

$$\Delta lnY_i = ln(\frac{\overline{Y_{i,1925-1927}}}{1.1 * W^T_{i,1925}/18}).$$

Debt In order to isolate newly accumulated debt $D^{\text{New}}_{i,1927}$ from the debt levels $D^{\text{All}}_{i,1927}$ given in Enquete Commission (1930) we need to reconstruct the reinstated debt in 1925 $D^{\text{Reinstated}}_{i,1925}$. For this purpose, we first use regional r data on the share of reinstated debt in overall debt by farm size k in 1927 (Deutsche Rentenbank-Kreditanstalt, 1929) to calculate the reinstated debt in 1927 for each county i

$$\frac{D^{\text{Reinstated}}_{r,i,1927}}{D^{\text{All}}_{r,i,1927}} = \sum_k \frac{Area_{k,i,1925}}{Area_{i,1925}} \times \frac{D^{\text{Reinstated}}_{r,k,1927}}{D^{\text{All}}_{r,k,1927}}$$

assuming the share of reinstated debt within a given farm size to be constant across counties within the same region.

Further, we use data from the same source on the share of reinstated debt that was repaid between 1926 and 1927 by farm size k to calculate for each county i in region r the repayment share $\omega_{r,i,1926-1927}$ as

$$\omega_{i,1926-1927} = \frac{D^{\text{Repaid}}_{i,1926-1927}}{D^{\text{Reinstated}}_{i,1926}} = \sum_k \frac{Area_{k,i,1925}}{Area_{i,1925}} \times \frac{D^{\text{Repaid}}_{r,k,1926-1927}}{D^{\text{Reinstated}}_{r,1926}}$$

again assuming the repayment share within a given farm size to be constant across counties within the same region. Further, assuming a constant yearly rate of repayment between 1925 and 1927 $\omega_i = \omega_{i,1926-1927} = \omega_{i,1925-1926}$, we calculate the amount of reinstated debt in 1925 for each county i as

$$D^{\text{Reinstated}}_{i,1925} = D^{\text{Reinstated}}_{i,1927} \times (1-\omega_i)^{-2}.$$

Our variable of interest in the main empirical analysis in Section 3 is thus

$$D^{\text{New}}_{i,1927} = D^{\text{All}}_{i,1927} - D^{\text{Reinstated}}_{i,1925}$$

which we normalize by population and log for interpretation:

$$ln(d^{\text{New}}_{i}) = ln(D^{\text{New}}_{i,1927} / N_{i,1925}).$$

B.4 Measuring debt deflation, 1928-1932

As pointed out in Section 2.3, we capture debt deflation as the change in the leverage ratios between 1928[5] and 1932:

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

For 1928, debts $D_{i,1928}$ and assets $W_{i,1928}$ are taken directly from the data, see Appendix Section A.3. For 1932, we project the debt stock forward, assuming a constant average yearly interest of 8%

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

For asset values in 1932, we rely on exogenous shifts in agricultural asset values due to commodity price changes and calculate

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

The following sections give details on, first, the derivation and, second, the calculation of $g^W_{i,1928-1932}$.

B.4.1 Derivation of the effect of commodity price changes on changes in land value

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

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

For assessing land values, tax assessors capitalize farm income by a factor of 18 (Statistisches Reichsamt, 1930, p. 10). The absolute change in farm values between two points in time $t = 0$ and $t = 1$ (for us, those points will be 1928 and 1932) is then given as

$$\Delta W = 18 \left[\sum_s p_{s,1} q_{s,1} - c_1 - \left(\sum_s p_{s,0} q_{s,0} - c_0 \right) \right].$$

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,

$$\Delta W = 18 \sum_s \Delta p_s q_s$$

[5] Note that $D^{All}_{i,1927}$ corresponds to $D_{i,1928}$ as debt is given on 01.01.1928.

and the growth rate of farm values g^W is given as

$$\begin{aligned} g^W &\equiv \frac{\Delta W}{W_0} \\ &= \frac{18 \sum_s \Delta p_s q_s}{18 \left(\sum_s p_{s,0} q_s - c\right)}. \end{aligned}$$

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,

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

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

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

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

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

i.e., the change in wealth 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.4.2 Construction of weights and weighted change in wealth

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

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

As we use market prices for the livestock wealth, we adjust the tax values to market values by multiplying them with factor 1.92 based on Albers et al. (2022). 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

$$W^c_{i,1928} = 1.92 \cdot W_{i,1928} - W^l_{i,1928}.$$

This allows us to calculate a weight $w^c_{i,1928} = \frac{W^c_{i,1928}}{1.92 \cdot W_{i,1928}}$ 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.

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 (1929b), 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,
- 96.5% of land included in the trade shock.

We calculate the change in wealth derived above and readjust from market prices to tax values as

$$
\begin{aligned}
g^W_{i,1928-1932} = & \frac{1}{(1-\zeta_0)} \\
& \cdot \Bigg(\Big((w^C_{i,1928} \cdot \sum_s \frac{Area_{i,s,1925}}{Area_{s,1925}} \cdot \frac{Price_{s,1932}}{Price_{s,1928}} \\
& + (1 - w^C_{i,1928}) \cdot \sum_s \frac{Stock_{i,s,1925}}{Stock_{s,1925}} \cdot \frac{Price_{s,1932}}{Price_{s,1928}}) \cdot 100 \Big) - 100 \Bigg) / 100 \cdot 1.92.
\end{aligned}
$$

The predicted agricultural wealth in 1932 is thus

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

B.5 Observed debt ratio in 1931

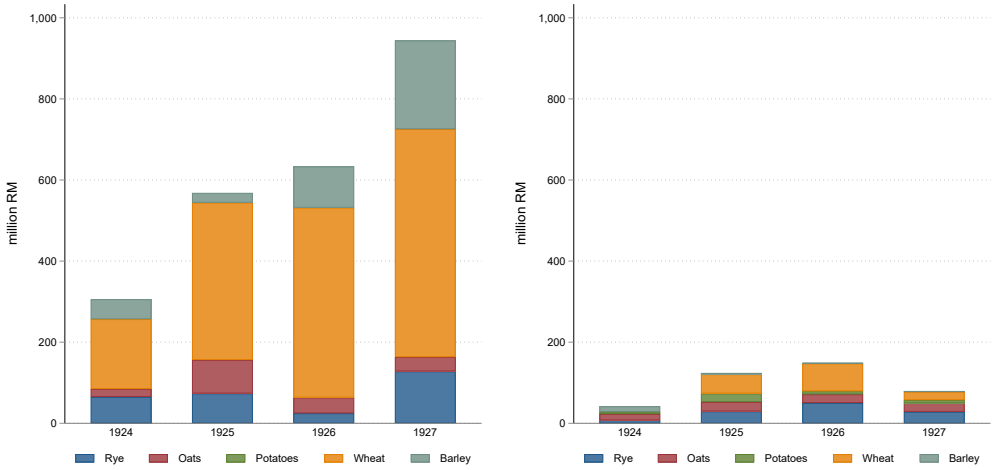
To calculate observed changes in the debt ratio between 1928 and 1931, we rely on detailed official agricultural statistics. The 1928 values for the debt ratio are readily available (Enquete Commission, 1930). While data on debt stocks $D_{i,1931}$ are not readily available at the county level in 1931, it 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 asset side, we employ the valuation statistics of 1931 to calculate the gross agricultural wealth $W_{i,1931}$. 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, also those two publications are 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 213 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.

C Additional figures and tables

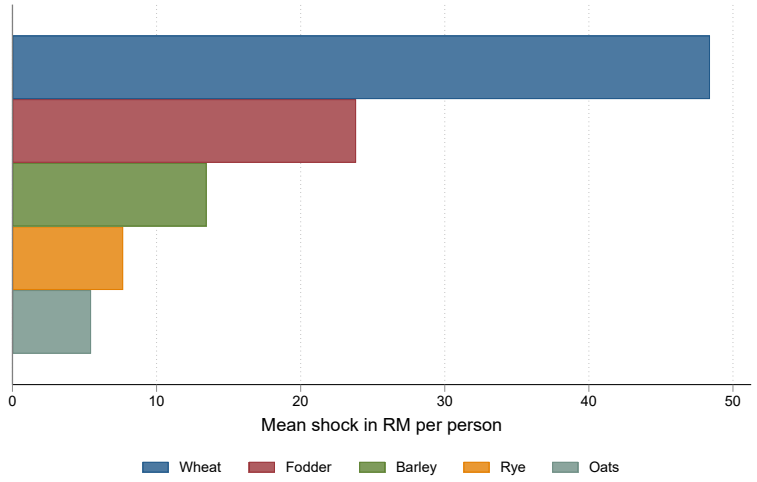
C.1 Additional figures and tables: Debt accumulation and discontent

Figure C.1: Comparison imports and exports



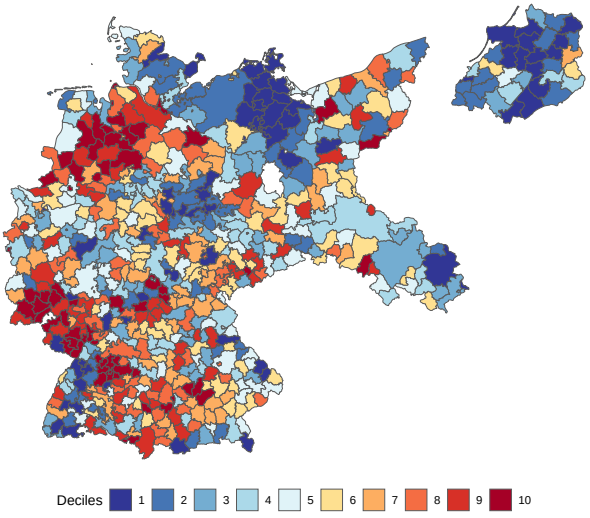
Notes: Figure C.1 shows the imports stemming from Argentina, Canada, and the US compared to total exports over the same period. *Sources*: See Appendix A.

Figure C.2: Mean shock exposure for five most affected products

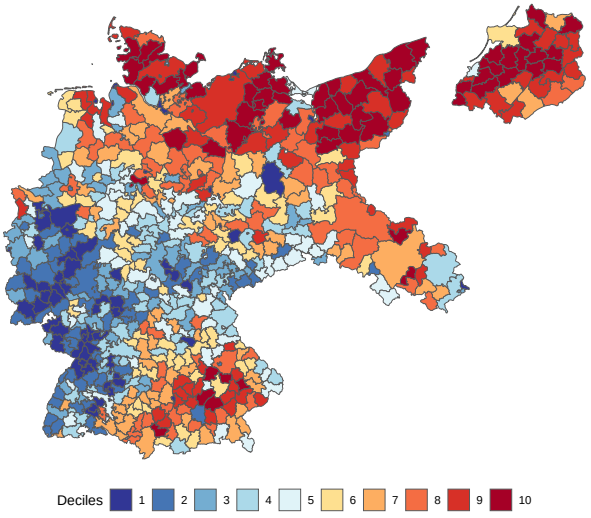


Notes: Figure C.2 shows the average shock exposure from 1925 to 1927 in RM per capita for the five most affected products. *Sources*: For the calculation of the shock, see Section 3.1.

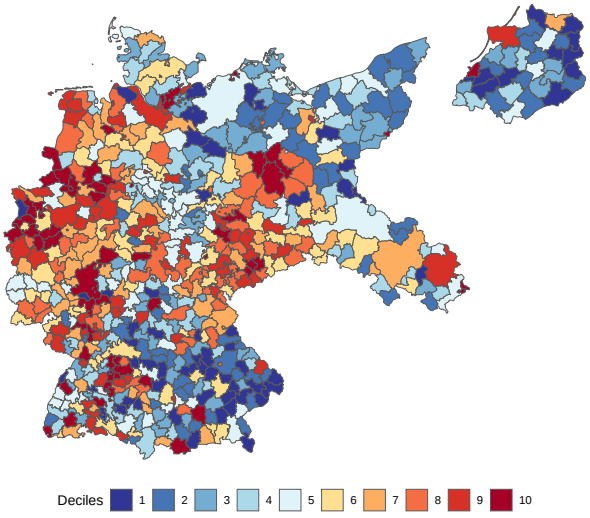
Figure C.3: Spatial distribution of income, debt, and migration



(a) Change in income



(b) New debt per capita



(c) Population change

Notes: All figures are divided in deciles. Figure 3(a) plots the change of agricultural income. Figure 3(b) documents the debt accumulation per capita. Figure 3(c) shows the change in the number of voters between the 1925 election and the 1929 referendum. *Sources*: See Appendix A.

Table C.1: Effect of import shock on debt uptake: Alternative debt measures

Dep. var.	Ratio new debts over assets $ln(D^{\text{New}}_{1927}/W^{T}_{1927})$		All debt p.c. $ln(D^{\text{All}}_{1927}/N_{1925})$	
	(1)	(2)	(3)	(4)
Import shock (in log)	0.330***	0.101**	0.932***	0.700***
	(0.060)	(0.047)	(0.137)	(0.126)
Mean dependent variable	2.94	2.94	5.07	5.07
SD dependent variable	0.56	0.56	1.13	1.13
Controls	✓	✓	✓	✓
Constituency FE		✓		✓
R-squared	0.29	0.72	0.48	0.80
Observations	313	313	313	313

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, and share of Hindenburg vote, all in 1925. Sample is restricted to above median agricultural employment share.

Table C.2: Political effect of debt uptake: Alternative referendum measures

Dep. var.	Yes vote share (in %)			Turnout (in %)		
	OLS		Second Stage	OLS		Second Stage
	(1)	(2)	(3)	(4)	(5)	(6)
New debt p.c. (in log)	1.636**			1.818***		
	(0.625)			(0.658)		
Import shock (in log)		1.417*	1.625**		1.546**	1.763**
		(0.725)	(0.699)		(0.760)	(0.735)
Mean dependent variable	20.02	20.02	20.02	21.69	21.69	21.69
SD dependent variable	16.11	16.11	16.11	17.41	17.41	17.41
Constituency FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
First stage F			672.41			672.41
R-squared	0.88	0.88		0.89	0.89	
Observations	313	313	313	313	313	313

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, and share of Hindenburg vote, all in 1925. Sample is restricted to above median agricultural employment share.

Table C.3: Political effect of import shock, robustness, varying sample splits

Dep. var.	Signatures referendum (in %)				
	(1)	(2)	(3)	(4)	(5)
Import shock (in log)	1.872***	0.271	1.878**	2.008**	4.679***
	(0.703)	(0.251)	(0.811)	(0.810)	(1.389)
Mean depedent variable	15.59	9.57	16.17	19.56	24.47
SD dependet variable	15.55	7.72	16.28	15.52	15.29
Constituency FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Urban sample		✓			
Agriculture > 60 pct			✓		
Without Bavaria				✓	
Only Prussia					✓
First stage F	672.41	4575.79	380.78	320.93	176.72
Observations	313	316	255	211	145

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, and share of Hindenburg vote, all in 1925. Given the discussion in the literature on the roles of Bavaria and Prussia (Guinnane and Hoffman, 2022; Voigtländer and Voth, 2022), column 4 shows the estimation without Bavaria, and column 5 only in Prussia. The different numbers of observations in columns 1 and 2 result from dropping singletons.

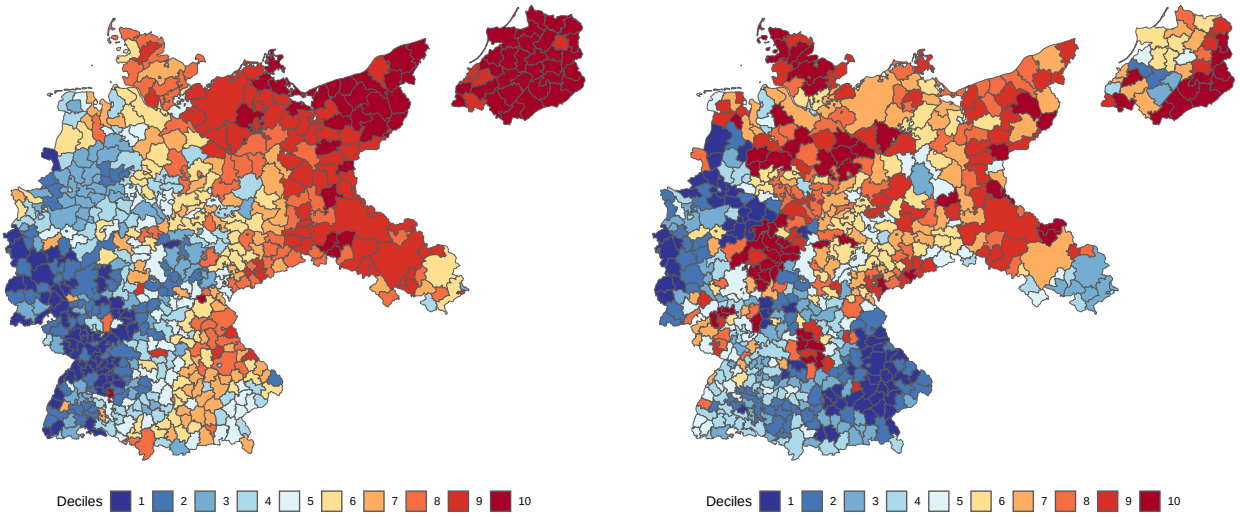
Table C.4: Spatial clustering, import shock

Dep. var.	Signatures referendum (in %)		
	Baseline	100km	200km
	(1)	(2)	(3)
Import shock (in log)	1.872***	1.872***	1.872***
	(0.703)	(0.712)	(0.622)
Mean dependent variable	15.59	15.59	15.59
SD dependent variable	15.55	15.55	15.55
Constituency FE	✓	✓	✓
Controls	✓	✓	✓
Observations	313	313	313

Notes: Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Controls are share of agricultural employment, share of Protestants, and share of Hindenburg vote, all in 1925. Sample is restricted to above median agricultural employment share.

C.2 Additional figures and tables: Debt deflation and the rise of the NSDAP

Figure C.4: Spatial distribution of debt deflation and Δ NSDAP vote share, 1928-1932



(a) $\Delta\widehat{Debt\ ratio}$, 1928-1932

(b) Δ NSDAP vote share, 1928-1932

Notes: Both figures are divided in deciles. Figure 4(a) documents the debt deflation between 1928 and 1932. Figure 4(b) documents the change in vote share for the NSDAP between 1928 and July 1932. *Sources*: See Appendix A.

Table C.5: Effect of debt deflation on NSDAP vote share, robustness, varying sample splits

Dep. var.	Δ Vote Share NSDAP, 1928-32				
	(1)	(2)	(3)	(4)	(5)
$\widehat{\Delta Debt\ ratio}$, 1928-1932	0.132***	-0.039	0.156***	0.144**	0.130*
	(0.048)	(0.031)	(0.048)	(0.059)	(0.064)
Mean dependent variable	30.30	30.32	30.12	34.82	37.37
SD dependent variable	14.56	9.45	14.82	13.04	12.03
Constituency FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Urban sample		✓			
Agriculture > 60 pct			✓		
Without Bavaria				✓	
Only Prussia					✓
R-squared	0.88	0.86	0.89	0.85	0.84
Observations	313	314	252	211	145

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, and share of Protestants. Given the discussion in the literature on the roles of Bavaria and Prussia (Guinnane and Hoffman, 2022; Voigtländer and Voth, 2022), column 4 shows estimation without Bavaria and column 5 only in Prussia. The different numbers of observations in columns 1 and 2 result from dropping singletons and missing data on debt levels for two counties.

Table C.6: 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)
$\widehat{\Delta Debt\ ratio}$, 1928-1930	0.046		
	(0.082)		
$\widehat{\Delta Debt\ ratio}$, 1928-1932		0.138***	0.139*
		(0.051)	(0.069)
Mean dependent variable	12.10	26.15	42.42
SD dependent variable	7.15	13.10	11.80
Initial vote share	✓	✓	✓
Constituency FE	✓	✓	✓
Controls	✓	✓	✓
R-squared	0.72	0.85	0.79
Observations	313	313	313

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, and share of Protestants. Sample is restricted to above median agricultural employment share.

Table C.7: Spatial clustering, debt deflation

Dep. var.	Δ NSDAP vote share, 1928-32		
	Baseline	100km	200km
	(1)	(2)	(3)
$\Delta\widehat{Debt\ ratio}$, 1928-1932	0.132***	0.132***	0.132***
	(0.048)	(0.043)	(0.044)
Mean dependent variable	30.30	30.30	30.30
SD dependent variable	14.56	14.56	14.56
Initial vote share	✓	✓	✓
Constituency FE	✓	✓	✓
Controls	✓	✓	✓
Observations	313	313	313

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

Table C.8: Effect of debt deflation on change in number of voters, 1928-1932

Dep. var.	Change in number of voters (in %)
	(1)
$\Delta\widehat{Debt\ ratio}$, 1928-1932	-0.001
	(0.028)
Mean dependent variable	8.80
SD dependent variable	4.37
Constituency FE	✓
Controls	✓
R-squared	0.24
Observations	313

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 and share of Protestants. Sample is restricted to above median agricultural employment share.

Table C.9: Additional controls for agricultural policies

Dep. var.	Δ Vote Share NSDAP, 1928-32			
	(1)	(2)	(3)	(4)
$\Delta\widehat{Debt\ ratio}$, 1928-1932	0.132***	0.133***	0.129***	0.126**
	(0.048)	(0.049)	(0.040)	(0.049)
Mean dependent variable	30.30	30.30	30.30	30.30
SD dependent variable	14.56	14.56	14.56	14.56
Constituency FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Osthilfe (dummy)		✓	✓	
Share estates			✓	
Specialization				✓
R-squared	0.88	0.88	0.88	0.88
Observations	313	313	313	313

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, and share of Protestants. Sample is restricted to above median agricultural employment share.

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