

The Borchardt hypothesis: a cliometric reassessment on Germany's debt and crisis in 1930-32

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Abstract

This paper examines whether an alternative exchange rate policy could have mitigated the German recession from April 1930 to May 1932, when Heinrich Brüning was the Reichskanzler of the Weimar Republic. Using counterfactual simulations based on shocks reflected in historical data, we show for a country such as Germany with a high level of foreign debt that the claimed advantages of the alternative policy (floating the Reichsmark) are far from certain since the balance sheet effects magnify the impacts of adverse external shocks. Our results present implications for the evaluation of Brüning's economic failure and for any member of a monetary union.

JEL Codes: E58, F32, G01, N14

Key Words: Borchardt hypothesis, Trilemma, sovereign default, foreign debt, Heinrich Brüning, Weimar Republic

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“Seine Erfolge – unbestreitbar erzielte er einige – hatten durchweg das Schema ‘Operation gelungen, Patient tot’ oder ‘Stellung gehalten, Mannschaft aufgerieben’.” (Haffner, 2000)

“His achievements – undeniably he scored some – consistently had the scheme ‘operation succeeded, patient dead’ or ‘position held, crew wiped out’.” (Haffner, 2000)

1 Introduction

The Great Depression hit Germany harder than other industrialized countries. Between 1928 and 1932, the country’s GDP declined by 26%, its index of industrial production by 41%, and investment by 62% (Figure 1). The number of unemployed persons rose from 1.4 to 5.6 million, with the unemployment rate increasing from 8% to 30%. The sharpest declines in economic activity, corresponding to the largest increases in unemployment, occurred in 1930-32. The economy began to recover in 1933, and economic activities and unemployment returned to their 1928 levels by 1936.

In the midst of this recession, Heinrich Brüning, the Reichskanzler of the Weimar Republic from April 1930 to May 1932, known as the *Hunger Chancellor*, adopted a series of austerity policies that increased tax rates while cutting state welfare benefits and civil service pay. Although foreign exchange controls (Devisenbewirtschaftung) were introduced by the middle of July 1931, Germany never abandoned the parity against gold in favor of floating, even after Great Britain left the gold standard in September 1931.

The dismal German economy during the Great Depression was pivotal for the political demise of the Weimar Republic. The perceived view up to 1979, in the Keynesian tradition, blamed the policy choices of Brüning for the catastrophic economic outcome and the subsequent political radicalization (Ritschl, 2003) and is echoed by those authors who highlight that the steadfast adherence to the gold standard was a policy mistake that ensured the spread of the Great Depression (Temin, 1989; Eichengreen, 1992). Borchardt (1979) challenged this argument on Germany’s slump by suggesting that Brüning had almost no room for maneuvering in regards to economic policy. By the time the necessity for government intervention became first recognized, it was too late to reverse the worst scenario. Suitable means for counter-cyclical policies were also not available.

In this paper we reassess the Borchardt Hypothesis, focusing on the question of whether floating the Reichsmark would have been a better alternative policy. We argue that Germany in the early 1930s resembled modern emerging market economies that borrow heavy from abroad to finance domestic investment. A real devaluation could have expanded exports, but might also have constrained the economy’s ability to borrow and invest due to the reduction of net worth. Given Germany’s interest payments of commercial debt and reparations payments in the early 1930s, floating the Reichsmark would not provide a better alternative.

Weimar policymakers were always reluctant to devalue the Reichsmark despite a deepening recession. Our paper formalizes and examines their arguments, using an open-economy dynamic model as an analytical framework. One of this model's features is the balance sheet for potentially harmful effects of real devaluation. The model incorporates a shock to the world real interest rate and a shock to world demand for the country's exports to reflect Germany's situation, and the model is specifically calibrated for the Weimar economy. We use the shocks reflected in historical data combined with counterfactual simulations to examine our research questions.

We offer different interpretations of Brüning's deflation policy. Peter Temin suggests that Brüning's policy was based on misguided doctrines, which he refers to as the *gold standard mentality* that pushed Brüning to adhere to the gold parity even when the German economy was already amid a severe recession. Implicit in Temin's argument is the Trilemma doctrine à la John Maynard Keynes and Robert Mundell, which assumes that there is a tradeoff between stable exchange rates and stable internal prices. Thus, if Brüning had been willing to float the Reichsmark, then the German economy would have stabilized. In contrast to Germany, those countries that did shift the Trilemma configuration to the focus of stable internal prices recovered sooner from the Great Depression and were exempted from banking crises (Grossman, 1994).

We disagree with Temin's argument. Simulations based on the shocks identified from the empirical data show for a country such as Germany, which incurred a high level of foreign debt (relative to the economy's net worth), that the claimed advantages of the alternative policy (floating the Reichsmark) are far from certain. Once foreign debt is taken into account, the alleged stable internal prices obtained by abandoning stable exchange rates would be quite limited and even nil.

For floating the Reichsmark in order to be expansionary, we show that Germany's foreign debt level must be reduced. In the debate about Brüning's deflationary policy, Carl-Ludwig Holtfrerich suggests that Brüning deliberately pursued this policy in order to eliminate reparations. Brüning's obsession with his political priorities made him blind to Germany's economic misery. In the popular press, the impression remains of Brüning as a figure with dismal and uncompromising intentions, as reflected in the quotation that begins this paper. In contrast, Knut Borchardt emphasizes that Brüning's room for maneuvering within the country's economy policy was rather restricted.

This paper follows Borchardt in emphasizing that Brüning's room for maneuvering within the country's economy policy was rather restricted. Taking our model to the debate on Brüning's alternative exchange rate policy, we show in addition to the political constraints emphasized by Knut Borchardt that Germany's foreign debt was another constraint that limited the effects of currency devaluation on its economy.

Both sides of the debate assume that whether alternative policies existed and whether they could help the German economy are purely domestic affairs. Therefore, the key

question is whether Brüning could and would have adopted alternative policies. This question focuses on the wrong point. Whether floating the Reichsmark would have helped depends not only on the willingness and ability of Brüning, but also on whether Germany's creditors would have cooperated, such as debt relief or debt extension. Even if Brüning were willing and able to float the Reichsmark, then without the coordination of Germany's creditors such a policy would be doomed to fail. The question of Weimar economic policy during the Great Depression should not conventionally be treated as a domestic issue, but rather must be seen from the perspective of international policy coordination, so as to give it a correct interpretation and in-depth discussion of alternative policies that include all the relevant players in the scenario. Our paper echoes the view of Straumann (2019) that the international perspective is at the heart of this issue, in the sense that both Germany and its creditors failed to come to grips with the rapidly worsening German economic and political situation.

In contemporary discussions of alternative policies, the elimination of German reparations has been considered a precondition for the success of expansionary policies. Hans Schäffer, state secretary in the Reich Finance Ministry, believed that the elimination of reparations was a pre-condition for Germany's economic recovery. Until a solution to the reparations question removed the pressure on the country's budget and restored international confidence in Germany, there could be no stabilization of its budget or even a program for public works. Any sign of budget deficits would have triggered capital flight, whose damages would easily outweigh the benefits of expansionary programs (James, 1983). Moreover, for fiscal (orthodox) reasons, Gustav Stolper, editor of *Der Deutscher Volkswirt*, suggested that the elimination of reparations would have been the pre-condition for economic recovery.

From the perspective of the balance sheet effects, we arrive at the same conclusion. For an alternative policy (floating the Reichsmark) to be expansionary, we show that Germany's commercial debt and reparations must have been within a reasonable limit. Since dealing with the foreign debt (commercial debt plus reparations) is a pre-condition for a successful alternative policy, international cooperation becomes equally as important as domestic factors in determining whether useful alternative policies really existed for the Brüning government.

There is a handful of literature discussing the macro-performance of Germany's interwar economy. The main issues include postwar hyperinflation (Balderston, 2002; Holtfrerich, 1986; Feldman, 1993), the distributional conflict (Schuker, 1988; Borchardt, 1991), the role of reparations (Gomes, 2010), the 1931 banking and payments crisis (James, 1986; Ferguson and Temin, 2003; Schnabel, 2004; Straumann, 2019), the beginning of Germany's recession (Temin, 1971, Falkus, 1975, Balderston, 1977; Ritschl, 2002a; Fisher and Hornstein, 2002), and the role of international capital flows (Kindleberger, 1973; McNeil, 1986; Schuker, 1988; Ritschl, 1998; Accominotti and Eichengreen, 2016; Ho and

Yeh, 2019).¹ This paper belongs to the literature analyzing alternative policy options during the country’s economic slump. That literature began with Borchardt (1979), continued with Krohn (1982), Borchardt (1983, a, b), James (1983), Holtfrerich (1996), Ritschl (2002b), and Straumann (2019). For example, it is suggested that abandoning balanced-budget policies would not prevent a major decrease in employment, while wage cuts appear to be a prerequisite for substantial reductions in unemployment (Borchardt and Ritschl, 1992). Galofré-Vilà et al. (2019) find that Brüning’s austerity measures were positively associated with increasing vote shares for the National Socialist German Workers’ Party. Our paper examine a question initiated by Borchardt: whether an alternative policy could have mitigated the recession with a focus on the exchange rate policy. To our knowledge, Schiemann (1980) is the only study to explore the effects of a Reichsmark devaluation on the German economy. Schiemann assumes that the Reichsmark first devalued in September 1931, when Britain devalued the pound sterling. He concludes that the effects of a Reichsmark devaluation on German income and employment would be negligible. The model Schiemann uses is relatively rough (Borchardt, 1983a).

Our paper also belongs to the strand of literature that studies counterfactual policies using formal models. To name a few examples, for the pre-1914 and interwar gold standard, Fagan et al. (2012) assess the extent to which economic volatility of the classical gold standard era would have been lower if a modern Taylor rule had instead been in place; Chen and Ward (2019) study whether elimination of a countercyclical monetary policy would have given rise to higher output volatility during the pre-1914 gold standard; Payne and Uren (2014) examine how would the Australian economy have performed during the Great Depression if policymakers had pursued modern-day practices; Ho and Lai (2016) demonstrate that China would have suffered from output loss and deflation in the early years of the Great Depression if it were on a gold standard. For recent studies, Leigh (2009) investigates whether alternative interest rate policy rules could have helped to avoid Japan’s Lost Decade; Del Negro et al. (2017) present what would happen to U.S. output and inflation in the counterfactual scenario of the absence of non-standard open market operations in the Great Recession. Our paper contributes to the literature by examining a compelling historical case that has not been done before.

¹While Ho and Yeh (2019) also briefly discuss currency devaluation, their paper mainly deals with the factors affecting Germany’s interwar capital flows and the impacts of capital flows on Germany’s business cycles between 1925 and 1931. Our current paper deals with alternative policies, especially regarding exchange rate policy, that were available to Heinrich Brüning between 1930 and 1932. Second, the models of the two papers are diametrically different. The model of Ho and Yeh (2019), following Mendoza (2010), comes from the Sudden Stops literature. The model of this current paper, following Céspedes, Chang and Velasco (2003, 2004, 2005), comes from the original sin literature. The model of Ho and Yeh (2019) is a real model without nominal variables and is less advantageous in the discussion of the choice of exchange rate regime. The current model herein allows for nominal variables (such as nominal exchange rates), nests both fixed (to stay with gold parity) and flexible (to float the Reichsmark) exchange rates, and contains a clear mechanism for how foreign-currency debt affects the economy via the balance-sheet effects, which were exactly what made Weimar policymakers reluctant to float the Reichsmark.

2 German economic policies under Brüning

Heinrich Brüning took office on March 30, 1930 when the German economy had already been in recession for more than a year. Table 1 provides a chronology of important events in the era Brüning. With a ‘Hindenburg Cabinet’, formed without a parliamentary majority, Brüning relied on the President’s powers under Article 48 of the Weimar constitution and the power of dissolution of Reichstag to govern.²

Brüning introduced the first rigorous deflation policy in July 1930. The intended reform of state finances included cuts in public expenditures, increases in taxes and levies, and a so-called ‘emergency contribution’ by fixed income earners (Kolb and Schumann, 2013, p. 133). Part of the proposals was rejected in the Reichstag on July 16, and Brüning decided to promulgate the proposals by emergency decree. This met strong opposition in Reichstag, which voted to abrogate them. In response, Brüning announced the dissolution of the Reichstag. A few days later (on July 26) and before the new election, which was scheduled for September 14, the abrogated proposals were reissued as the emergency decree *Verordnung zur Behebung finanzieller, wirtschaftlicher und sozialer Notstände*. The austerity measures of the emergency decree were even more stringent than the proposals submitted to the Reichstag (Holtfreich, 2016). The decree introduced a civic tax graduated according to social class, an increase in income tax, a tax on unmarried people, and an increase in unemployment contributions from 3.5% to 4% (Winkler, 2015, p. 416).

As the recession deepened and the fiscal deficit widened, a further emergency decree, *Notverordnung zur Sicherung von Wirtschaft und Finanzen 1*, was issued on December 1, 1930. The decree increased the tobacco tax and brought a renewed further increased the contributions of unemployment insurance to the peak of 6.5%. The focus of the decree, however, was a further 6% reduction of civil servants’ salaries, which had already been implemented by the previous decrees, and the introduction of an expenditure ceiling for the Reich government (Albers, 1976). In short, the emergency decree embraced harsh cuts of public expenditures and comprehensive reductions in public salaries that began with a 20% cut in the salary of President von Hindenburg.

From January to April 1931, some signs of upswing had appeared that gave hope for an end to the crisis, with increases of some important indicators of the economic cycle (Borchardt, 1979). To the German authorities, the economic recession until mid-1931 appeared not to be different in essence from Germany’s preceding economic recessions. After the Austrian Credit-Anstalt Crisis broke out on May 11 and the signs of recovery had disappeared worldwide, an emergency decree, *Notverordnung zur Sicherung von Wirtschaft und Finanzen 2*, was issued in June 5, 1931. The decree increased the sugar

²Texts of the emergency decrees mentioned below are taken from *Deutsches Reichsgesetzblatt*, available from the Österreichische Nationalbibliothek under http://alex.onb.ac.at/tab_dra.htm.

tax and mineral oil duty. The decree also introduced an income-related crisis tax, which could amount to 4% and 5% of income. The civil servants' salaries were cut for the third time, by between 4% and 7%. Unemployment benefits were reduced by between 10% and 12%, and payments to invalids and disabled veterans were also reduced. The decree was an attempt by the government to balance the budget in face of the recession's unexpected duration and severity.

The decree could not stop the twin crises that broke out in Germany during the summer of 1931.³ A trend of capital outflows had started from July 1930 under the government crisis and was intensified by the Reichstag election in September 1930, when the Nazi Party became the second largest party in the Reichstag. The Reichsbank lost about 17% of its foreign reserves between July and October 1930. Capital outflows entered an extreme phase in May 1931, when the renowned Austrian bank, Credit Anstalt, announced huge losses. In a single month, the Reichsbank lost about 33% of its reserves. Deposits by commercial banks followed the same pattern as foreign reserves of the Reichsbank. In July the discount rate of the Reichsbank rose to 7% to stop capital outflows, making the discount rate difference between Germany and the U.S. as high as 5.5%. A general banking crisis erupted on July 13, as the failure of Darmstädter und Nationalbank on July 13 led to a general run on banks and forced a closure of all German financial institutions. A number of banks declared themselves illiquid. The crisis reached its full scale when on July 15 the Reichsbank suspended convertibility of the Reichsmark into gold and imposed capital controls.

Before the financial collapse, many observers assumed that depression was nothing more than a cleansing crisis of the kind that occurred in 1924 and again in 1925-26 (James, 1983). With the financial collapse of summer 1931, however, the realization grew that the recession had entered a new and worse phase. At this point, various plans for expansionary policy, mostly in the form of public works programs, had been called for, even by those who believed that the crisis constituted a self-cleansing process (Klausinger, 2001). Nevertheless, Brüning held firm on the deflation policy.

Britain abandoned the gold standard on 21 September 1931 and the pound sterling was initially devalued by some 25%. Even after the United Kingdom devalued the pound sterling in September 1931, the German government did not devalue the Reichsmark. Instead, it intensified its policy of internal deflation in order to counteract Germany's competitive disadvantages (Büttner, 1989). An emergency decree, *Notverordnung zur Sicherung von Wirtschaft und Finanzen 3*, was issued on October 6, 1931, as an attempt to improve Germany's international competitiveness. The decree, though without drastic fiscal measures, reduced personnel expenses (state pensions by 5% to 15%), included a requirement for approval of public-sector borrowing and attempted to consolidate the debts of provincial governments and municipalities. The decree ordered the stop of all

³For a description of the German financial crisis of 1931, see Yeh et al. (2019).

public building projects for the next three years.

The most painful emergency decree, as a further reaction to Britain's devaluation of the pound, was issued on December 8, 1931 under *Notverordnung zur Sicherung von Wirtschaft und Finanzen 4*, and included substantial cuts in wages, retail prices, and rents. The value added tax was increased from 0.85% to 2%, except for bread and flour. There was a further reduction in civil servants' salaries by 10%, and a general reduction of wages and salaries of industrial employees not to exceed 10% unless a reduction had not been implemented since July 1.⁴ The alleged aim was to lower the wage scales to the level of January 1, 1927 (Holtfrerich, 2016). The period of unemployment insurance eligibility was cut to between 16 and 20 weeks (James, 1986, p. 67). To compensate for the reduction in disposable income, a price commissioner empowered with extraordinary power was established to enforce the reduction of prices. The prices of coal, iron, and public utilities (such as railroads) were reduced, and rents were reduced by 10% to 12%. Along with price measures, the interest rate was cut by 6%. The decree "linked wage and price reductions in such a way as to ensure that the purchasing power of the masses was not significantly impaired, while increasing the attractiveness of German exports" (Winkler, 2015, p. 424). The decree also introduced a capital flight tax of 25% on the wealth of the person involved.

The *Notverordnung zur Sicherung von Wirtschaft und Finanzen 5*, the last emergency decree by Brüning, was issued on June 15, 1932 and put into force by his successor after his resignation. The decree reintroduced the salt tax, whose abolition had been proposed by the government before the crisis in 1929. The decree also abolished the exemption limit of 5,000 RM in value added tax, and reduced social benefits by 7.5%, to their 1927 levels.

Figure 2 shows the extent of Brüning's austerity measures. Public expenditure and transfers (including all levels of government) per person declined by 29% between 1930 and 1932. Despite government efforts to increase tax rates and contributions to unemployment insurance, government revenue per person declined by 24% during this same period.

Interpretations of Brüning's deflation policy have focused on why an expansionary policy was not pursued. On the one hand, it has been suggested that Brüning had almost no room for maneuver in regards to economic policy (Borchardt, 1979; 1983a; 1983b). At least until early 1931, people still believed in the self-healing ability of the economy. Only with the outbreak of the Austrian Creditanstalt crisis in May and Germany's financial crisis in July 1931 was the necessity of government intervention first recognized, but by that time it was too late to reverse the situation. Suitable means for countercyclical policy, i.e., foreign loans and central bank loans, were also not available. Further foreign borrowing was impossible because no one was willing to lend to Germany (Stolper, 1989). Furthermore, foreign loans, especially from France, were strongly opposed by President

⁴Civil servants' salaries had been cut by up to 23% during the Brüning era (James, 1986, p. 69).

von Hindenburg, and also went against the Brüning government's foreign policy. Loan expansion by the central bank would violate the regulations of the Reichsbank, which was an international contract.

Similarly, it has been suggested that the financial collapse of summer 1931, which set out a wave of capital flight, constrained the policy of German government (James, 1983). Germans who sent their money abroad feared that the extent of short-term public debt would cause the external value of the Reichsmark to fall, and this fear raised significant obstacles in the use of deficit-financed expansionary policies. Any sign of public deficit would have ruined trust on the currency and further intensified capital flight. This interpretation implies that the government had not dealt properly with the budget when it was possible to do so, before 1929. A related view, which likewise emphasizes the role of external constraints, suggests that Brüning's austerity policy was a passive reaction to the foreign credit constraints imposed by the Young Plan (Ritschl, 2012). This is because as long as there was any hope of returning to international credit markets, a policy consistently pursued by the German government since Gustav Stresemann, it made sense to fulfill the Young Plan, deflating the economy to service commercial debt while hoping for reparations to be reduced or eventually eliminated.

Devaluing the Reichsmark was infeasible, because the Young Plan of 1930 forbade a devaluation of Reichsmark. Maintaining the external value of the Reichsmark was also considered inviolable, because the memory of the total collapse of the exchange was just recent. The fear of devaluation was so strong that even advocates of expansionary policies proposed such policies only if they would not endanger the par value of the Reichsmark (Stolper, 1989).

On the other hand, some suggest that Brüning's deflation policies were deliberately pursued. Brüning's policy, characterized by an anti-parliament attitude hostile to the welfare state, accommodated the demands of industrialists, who had been complaining that the rising wages, national debt, and interest rates were destroying corporate profitability (Plumpe, 2016, pp. 197-226). Brüning followed a senseless economic policy for irrelevant, primarily political reasons: in domestic policy he intended to radically change or even overturn the social security system that was legally created in 1927; in foreign policy he attempted to end the reparations payments, and he believed that he could convince the Allied Powers of Germany's insolvency by the extent of Germany's economic misery (Sanmann, 1965; Mommsen, 1976; Schulz, 1980; Holtfrerich, 1982). It is even suggested that the political goal of ending the reparations distorted the entire design of economic policy, and that this had led to a series of fundamentally irrational calculations in the government decision-making (Holtfrerich, 1982; 1996). At least after October 1931, there was broad social and political support for a change in the deflationary policy, and alternative programs were also readily available (Büttner, 1989). Brüning deliberately

pursued deflationary policies to get rid of reparations.⁵ This attempt to force the Allies to reduce reparations by engineering a domestic economic crisis was similar to policies adopted by earlier governments between 1919 and 1921 of currency depreciation to force the Allies to change their stance (Ferguson, 1998). The implication is that instead of eliminating the reparations debt, Brüning could have put full employment and economic growth as main priority, and these programs would have had a chance to be adopted and the recession might have been mitigated.

3 Analytical model

3.1 Main features

The analytical model we employ is an extension of Céspedes, Chang, and Velasco (2003, 2004, 2005). This model introduces balance sheet effects into a standard model of the open economy that incorporates a shock to world real interest rate and a shock to world demand for the country's exports. The potentially harmful balance sheet effects of real devaluation reduce domestic net worth, so they increase the country risk premium of foreign debt and thus the cost of capital. Online Appendix 1 describes the model in more detail as well as our derivation of the equilibrium conditions and the solution method.

Several factors motivate our choice of this analytical model. First, it is a general equilibrium optimizing dynamic model that can explain the link between exchange rates, balance sheets, and the capacity to borrow and invest. The model nests both fixed and flexible exchange rates, contains a clear transmission mechanism for how foreign-currency debt affects the economy via entrepreneurs' balance sheet, and allows for a rigorous counterfactual analysis. Thus our approach is an advancement over previous studies, whose analyses are narrative and lacking explicit transmission mechanisms.

Second, balance sheet effects interact with external shocks, so that the response of the economy to external shocks depends on the exchange rate regime in place. On the one hand, balance sheet effects can magnify the impacts of adverse external shocks. On the other hand, conventional expenditure switching effects are still present so that devaluation may be expansionary or contractionary. These features of the model conform with the circumstances during the 1930–1932 period; as shown in Section 2, it was these same considerations that appeared in the pros and cons for exchange rate devaluation.

The economy's foreign borrowing, and hence aggregate demand, is constrained by

⁵In a similar but milder tone, it is suggested that Brüning rejected loan-financed job creation programs, because such programs would be against his fundamental belief in the need for a balanced budget and at the same time contradicted his main priority in foreign policy: the end of reparations. "Germany could not give the impression that it still had financial resources at its proposal, for this would have undermined its argument that the burden of reparations was crippling the German economy" (Winkler, 2015, p. 425).

its net worth. Real exchange rate may affect net worth by altering the relative burden of debt, because debt is in foreign currency while income is in domestic currency. The model's transmission mechanism works as follows. A real devaluation is required as an adjustment to an external shock, such as a fall in export volumes. Devaluation in the current period implies an expected revaluation between the current and the next period, and hence by interest rate parity reduces the cost of foreign borrowing. Investment thus increases. Meanwhile, the country risk premium is endogenously determined by the economy's net worth. Devaluation worsens the economy's balance sheet, increases the country risk premium of borrowing abroad, and thus depresses investment. The balance sheet effects dominate in a financially vulnerable economy, causing investment, output, and employment to fall following a real devaluation.

Balance sheet effects are responsible for two model features that are crucial for our analysis. First, when the expenditure switching effects dominate, a real devaluation is expansionary. Yet for a high ratio of foreign debt to net worth and for a high sensitivity of country risk premium to that ratio, the balance sheet effects prevail and a real devaluation becomes contractionary, given the same exogenous shocks. This feature of the model allows us to explain why Weimar's policymakers, in the face of high foreign debt and highly sensitive investor sentiment, were reluctant to allow the Reichsmark to devalue despite a deepening recession.

Second, response of the real exchange rate following an external shock differs between fixed and flexible exchange rates. This difference in response of the real exchange rate is the key factor determining the relative stabilization property of fixed and flexible exchange rates. Note that a real devaluation will take place regardless of the exchange rate regimes. What the exchange rate policy can only and crucially affects is the manner and timing of the adjustment. In the short run, the response of the real exchange rate is larger under the flexible exchange rate, although there is no difference in the long run. It follows that as the balance sheet effects increases, given the same exogenous shocks, the advantage of flexible exchange rate over fixed exchange rate also declines. That is to say, the precise effects of external shocks depend jointly on the exchange rate in place and the extent of balance sheet effects. It is here that exchange rate policy plays a prominent role in stabilizing the economy.

Figure 3 demonstrates the model features by plotting how selected variables respond to a negative export demand shock.⁶ The left panel of Figure 3 plots the responses of output, labor, CPI index, and consumption, contrasting the case of a fixed exchange rate with a floating exchange rate.⁷ Figure 3 shows that output, labor, and consumption are quickly stabilized under a floating exchange rate, while under a fixed exchange rate

⁶The parameter values on which Figure 3 is based are given in Table 2. The calibrated economy is financially vulnerable; namely, the balance sheet effects prevail so that real exchange rate depreciation causes a decrease in the investment.

⁷All the variables are expressed log-deviation from their steady states.

the impacts on output, labor, and consumption are larger and it takes a longer time to return to the steady state. The market clearing condition implies that without exchange rate flexibility as a buffer that absorbs part of the shock, output must fall concurrently with the fall in export demand, thereby dramatically reducing demand for labor and capital inputs. As a result, a fixed exchange rate leads to a far sharper decline in output, labor, and capital on impact than under a floating exchange rate. The figure is consistent with the conventional argument that when facing a negative external shock, a floating exchange rate performs better than a fixed exchange rate regime.

The right panel of Figure 3 plots the response of real exchange rate, capital, net worth, and risk premium. Here, several differences in the transmission mechanism between fixed and floating exchange rates stand out. First, the need to restore equilibrium make the real exchange rate depreciate under both fixed and floating exchange rates, but the amount is larger under a floating exchange rate. Since the exchange rate is fixed, the real exchange rate adjustment under a fixed exchange rate is achieved by internal deflation (decline in producer price), as somehow exemplified by the much larger decline in the CPI index. This adjustment is slow due to producer price rigidity. In contrast, the adjustment in the real exchange rate under a floating exchange rate is facilitated by depreciation of the nominal exchange rate. With a constant producer price (by construction) and an increase in the price of imported goods due to currency depreciation, the CPI index under a floating exchange rate actually increases.

Second, net worth increases under a fixed exchange rate, while it decreases under a floating exchange rate. This is because entrepreneurs' net worth is the sum of firm profits and rent on capital (both in domestic currency), minus the foreign debt repayment (in foreign currency). There are thus two counteracting forces that determine the net worth as noted below.

(a) Real depreciation increases the real burden of the existing foreign debt repayment and therefore reduces the net worth, or the so-called balance sheet effects. Following a negative export demand shock, the real exchange rate depreciates under both fixed and floating exchange rates. However, real exchange rate depreciation is much larger under a floating than under a fixed exchange rate, making the net worth to decline much larger under a floating than under a fixed exchange rate.

(b) The entrepreneur receives firms' profits plus rent on capital, which is equal to output minus wage expenditures. A decline in wage expenditures (real wages multiplied by labor employment) increases entrepreneur net worth. Under a floating exchange rate, the decline in wage expenditures is roughly balanced by the decline in output. However, under a fixed exchange rate, due to the dramatic fall in real wages and labor input on impact, the decline in wage expenditures is even larger than the decline in output, making the net worth increase.

For a fixed exchange rate, the increase in net worth due to factor (b) is larger than

the decrease in net worth due to factor (a), and hence net worth rises. Due to the decline in foreign borrowing and a falling risk premium, net worth continues to increase in the subsequent periods. For a floating exchange rate, factor (a) dominates factor (b), and net worth falls. If we assume that firms' profits are not accrued to the entrepreneur, then net worth would decline under both fixed and floating exchange rates. However, the baseline that the decline in net worth is larger under a floating than under a fixed exchange rate remains unchanged.

The third difference is that under a fixed exchange rate, capital rebounds much faster than under a floating exchange rate. To explain the rapid recovery of capital under a fixed exchange rate, note that net worth increases under a fixed exchange rates. The increase in net worth reduces the risk premium and hence the cost of capital, thereby raising the demand for capital input. As the balance sheet effects become stronger, this model feature can eventually reverse the relative performance of fixed and flexible exchange rates.

3.2 Calibration of parameters

Table 2 reports the values assigned to the models' parameters. Using Germany's interwar data to calibrate the model parameters may be problematic since the German economy in the 1920s was turbulent. First there was postwar hyperinflation before 1923, then currency stabilization and economic boom between 1924 and 1928, followed by recession and financial collapse. We adopt two ways to overcome this concern. First, we take from the literature the parameter values calibrated to emerging markets, because Germany's situation in the 1920s (as a importer that incurred high level of foreign debt), is similar to emerging markets that suffer from the original sin problem (Eichengreen and Hausmann, 2005, eds.). Second, for those crucial parameters, we assign a series of values rather than a single value to the parameter, in order to examine the robustness of our results.

For the first part of the calibration, the choice of most parameter values follows Céspedes, Change, and Velasco (2003, 2004, 2005). The capital share in the production of the domestic goods α is assumed to be 0.35, in accordance with standard estimates. We set the steady state world real interest rate ρ to 4%. The sensitivity of country risk premium to the ratio of foreign debt to net worth μ , an indicator of the degree of capital market imperfections, is set to 0.02. The elasticity of world demand for domestic goods χ is set at 0.50. The discount rate β is set at 0.99, which implicitly assumes that the annualized equilibrium real interest rate is 4%. The share of domestic goods in the production of consumption γ is set at 0.60. We assume that the elasticity of money demand ε^{-1} is equal to 2.5. Both the elasticity of substitution among different labor types σ , and the elasticity of labor supply v , are set at 2. Both the shock to the world interest rate and the shock to the world demand for domestic goods are assumed

to be first-order autoregressive process with autoregressive coefficient equal to 0.90. This assumption is trivial, because in practice both shocks are identified from the data. We set the degree of price rigidity θ_p to 0.75, implying that prices of domestic goods are on average adjusted every 4 quarters. We set the degree of wage rigidity θ_w equal to the degree of price rigidity.

In this model the profits of firms are distributed to the investors. In order to have a non-trivial solution in which the steady-state country risk premium is positive, the entrepreneurs' saving rate δ cannot be too large and the elasticity of substitution between domestic goods θ cannot be too small. The value of δ and θ together determine the steady-state ratio of foreign debt to net worth $\frac{SD}{PN}$ ($\equiv \psi$). For the second part of calibration, we fix the value of δ at 0.80. We let θ vary from 20 to 820, each time increases by 100, thereby creating a set of ψ , where each one represents a different degree of balance sheet effects at work. The balance sheet effects are stronger when ψ is larger. Here, ψ is monotonic increasing in θ , so that a large value of θ implies a larger value of ψ and larger balance sheet effects (see Table 3).

4 Empirical results

4.1 External shocks affecting the German economy

To answer the question of whether exchange rate flexibility would have helped stabilize the German economy in the early 1930s, we first recover the structural shocks by using quarterly German real GDP and German CPI. We use these two variables, because they satisfy the invertibility condition for the inversion filter (see Online Appendix 1) and are directly relevant to our empirical analysis.

Both series are taken from Ritschl (2002b, Table C.2). Quarterly real GDP in 1913 market prices is interpolated from annual real GDP by the method of Chow and Lin (1971) with the index of gross production value constructed by Institut für Konjunkturforschung and taken from Wagemann (1935) as the indicator for interpolation. Quarterly CPI index is the official cost-of-living index compiled from various issues of the *Statistisches Jahrbuch für das Deutsche Reich*. Due to the short data span, both series are transformed using growth rate instead of HP filter. We assume a fixed exchange rate when recovering the structural shocks, even though exchange rate controls were introduced in July 1931 (Eichengreen and Sachs, 1985).

The left panel of Figure 4 plots the two observables and the fitted series obtained from inputting the constructed shocks to the model. For each of the two observables the fitted series is identical to the actual series, indicating that the inversion filter is working properly. The right panel of Figure 4 reports the shocks to export demand and the shocks to the world interest rate. Note that the figure plots the nine series of structural shocks

recovered when we let the value of ψ change from 0.3009 to 33.3531 (see Table 3). The structural shocks we identify are almost unaffected by changing the value of ψ .

The shocks to export demand saw continuous deterioration since early 1930, when impacts of the Great Depression reached Germany. Shocks to export demand became relatively benign after 1933. The shocks to world interest rate began to rise in the third quarter of 1930, at roughly the same time the Nazi Party dramatically increased its number of seats in the Reichstag election. They increased sharply again in the second quarter of 1931, coincident with Germany's twin crises at that time. The shocks reached their peak in the first quarter of 1931, after which they decreased sharply.

In line with the spirit of *business cycle accounting* as proposed by Chari et al. (2007) and Brinca et al. (2016), the measured shocks are fed back into the model one at a time to assess how much of the actual changes in the real GDP and CPI can be accounted for by each of the two shocks.

The upper panel of Figure 5 plots the actual and the predicted real GDP, using either only export demand shock or only world interest rate shock. There are nine predicted real GDP series, each obtained by using the recovered structural shocks at different values of ψ . The prediction has been smoothed using the 2-period centered moving average. The figure shows that the prediction based on the export demand has a similar trajectory to that of the actual series. Remarkably, it accounts for much of the drop in real GDP during the years of the Great Depression. The prediction based on the interest rate shock alone also explains some of the fluctuations in real GDP before 1931. However, starting from 1935, export demand shocks became less relevant for the recovery of real GDP, while interest rate shocks became more important, consistent with the more autarky-oriented policy of the nation's economy under the Nazi regime. The lower panel of Figure 5 plots the predicted CPI. Again, export demand shocks account for much of the variation in German CPI, while interest rate shocks play a minor role.

Table 4, which translates Figure 5 into numbers, reports the correlation between the actual series and the predicted series. The table reports the medium value of the nine predictions and the associated p-value. The prediction based on the export demand rate is positively and strongly correlated with both actual series, with a coefficient of 0.33 and a p-value of 0.02 for real GDP, and with a coefficient of 0.85 and a p-value of 0.00 for CPI. The correlation increases further when the sample is restricted to the period from 1930 to 1934. In contrast, the prediction based on the interest rate alone is only statistically significantly correlated with the real GDP. Both Figure 5 and Table 4 suggest that shocks to export demand were the main forces driving the variation in Germany's real GDP and CPI for our study period.

4.2 Would floating the Reichsmark have led to inflation?

A number of arguments against the option of devaluation have been advanced (Klausinger, 1998). Winkler (2015, p. 425) summarizes: “In Brüning’s eyes, it was not possible to respond to London’s move by devaluing the mark not only because to have done so would have played on Germany’s traumatic fear of inflation but also on account of Germany’s dependence on American loans, together with its obligations with regard to reparations and, not least, questions of national prestige.” First, devaluation would have been seen as confirming the weakness of Germany’s financial and monetary policy and therefore would have shaken the precarious situation of German external debt, leading to capital flight. Ho and Yeh (2019) show that exchange rate depreciation would have expanded the German economy, though capital output flows would have easily eliminated the benefit of exchange rate depreciation (see also Eichengreen, 1994). Second, it was stated that devaluation would make the real value of reparations and foreign debts unbearably high. Since the government entities, the banks, and the corporations held huge short-term foreign debts, a devaluation would have greatly increased the debt burden. Third, the dominant economic issue in the devaluation discussion was the question of inflationary effects. In the face of hyperinflation, devaluation has become synonymous with inflation. Borchart (1984) suggests that fear of inflation was the most important reason for not leaving parity. Politicians and bankers, as well as business and union leaders across Europe feared that devaluation would lead to inflation and were reluctant to deliberately devalue their currencies in the 1930’s (Straumann, 2009).

Instead, a policy of internal deflation, by lowering domestic prices and costs of production, was considered to be a substitute for devaluation that could achieve the same purpose, of improving German export competitiveness. Especially after devaluation of the pound sterling, by emergency decree the German government cut rents, wages, and salaries, among others by as much as 15% (Büttner, 1989, p. 213).

Given our model and the recovered structural shocks, we start by examining whether the fear of inflation was realistic. Brüning became Reichskanzler on 30 March 1930 and resigned on 30 May 1932, so our simulation starts from the second quarter of 1930 and ends at the last quarter of 1934. In the simulation, the first observation, in the first quarter of 1930, is assumed to be at the steady state. The simulation starts from the next quarter by feeding those recovered structural shocks into the model. We purposely extend the simulation to 1934 to examine the long-term effects of a flexible exchange rate. We also simulate the trajectories of real GDP, labor, CPI, and real exchange rate under fixed and flexible exchange rates. To facilitate the comparison, we use the 2-quarter centered moving average of the simulated series.

Table 5 reports the mean and the standard deviation of the simulated CPI inflation under alternative exchange rate regimes. For the period 1930Q2-1934Q4, the floating

exchange rate tends to be associated with inflation, while the fixed exchange rate is associated with deflation. The standard deviation of CPI is also larger under the flexible exchange rate. However, the inflation rate never exceeds 2.7% on average, indicating that the fear of inflation is unwarranted. For the period 1930Q2-1932Q2, or roughly the same period under the Brüning government, CPI inflation would be somehow higher, between 5.0% and 7.9% on average. However, this scale of inflation is far below the kind of inflation that the German policymakers feared.

4.3 Would floating the Reichsmark stabilize output?

To examine whether floating the Reichsmark would help to stabilize output, we report the cumulative output loss under an alternative exchange rate regime. In addition, following the Trilemma literature, we also compute a tradeoff ratio, defined as the reduction in output volatility that can be obtained by an increase in nominal exchange rate volatility. Robert Mundell's Trilemma implies that given free capital mobility, Trilemma becomes the trade-off between internal stability (monetary independence) and external stability (exchange rate stability). Since an independent monetary policy helps to stabilize output, in this context it is synonymous with output stability.

Given the shocks facing the German economy, the upper panel of Figure 6 shows that in terms of cumulative output loss, a flexible rate performs better than a fixed exchange rate, as long as the ratio of foreign debt to net worth is below 18.4535. In terms of the trade-off ratio (the lower panel of Figure 6), once the ratio of foreign debt to net worth exceeds 10.1411, a flexible exchange rate can no longer bring about output stability by sacrificing exchange rate stability.

The question of whether an alternative exchange rate policy exists thus becomes where did Germany's ψ lay. It is not easy to construct a ψ for the German economy because of the difficulty in matching the model concepts to the actual economy. With the risk of over-simplification in mind, we proceed as follows.

The ratio of foreign debt to net worth ψ cannot be directly computed, since net worth is not observable. However, ψ can be constructed from the value of investment relative to foreign debt, because $\psi = \left(\frac{QI}{SD} - 1\right)^{-1}$. For the year 1929, Hoffmann (1965, p. 260) reports that Germany had a net investment of 5,770 million Reichsmark. Papadia and Schioppa (2015, Table 1) state that Germany incurred foreign debts amounting to 67.6 billion Reichsmark (including commercial debt and reparations). What Papadia and Schioppa (2015) present is the stock of outstanding foreign debt, but for the exercise here, the more relevant numbers are the debt payments in that year, including interest payments of commercial debt and reparation payments. Using Germany's balance of payments provided by Ritschl (2002b, Table B.4), the interest payments and reparation payments equal 3,137 million Reichsmark. This gives a ψ value of about 1.19. It seems

that the value of ψ thus obtained is low and therefore a flexible exchange rate would be a better alternative.

This is, however, not the case. Germany was facing increasing debt payments and its net investment was fluctuating. Any moderate increase in debt payments or decrease in net investment would substantially push up the value of ψ . As the value of net investment is getting close to the foreign debt payments, implying that the net worth is shrinking to zero, the value of ψ will approach infinity. A flexible exchange rate also becomes worse than a fixed exchange rate.

In 1930, for example, debt payments were 2,706 million Reichsmark, which means any value of net investment close to 2,706 million Reichsmark would imply an extremely large value of ψ . In fact, net investment in that year was only 2,630 million Reichsmark, or even less than 2,706 million. Germany had a negative net worth. From another perspective, cancellation of the reparation payments, which were equal to 1,706 billion Reichsmark in 1930, would push the value of ψ back to the safe value of 0.61. For the years 1931-32, even though debt payments decreased somehow, German net investment actually turned negative, as Hoffmann's data indicate. The value of ψ was definitely beyond the safe range for a flexible exchange rate to work. Therefore, German policymakers' concern that a floating exchange rate may not deliver a better economy outcome was fully legitimate.

In sum, this exercise indicates that given the shocks to Germany's economy and the existence of balance sheet effects that mitigate the stimulating effects of exchange rate depreciation, a floating exchange rate policy is never guaranteed to be better than a fixed exchange rate. Regardless of whether a floating exchange rate policy was possible at that time, technically a floating exchange rate would not have provided a better alternative.

Brüning had insisted on his policy of deflation until the end of his chancellorship. An often-cited anecdote is that Brüning and Reichsbank President Hans Luther had actually secretly planned on a 20% devaluation of the Reichsmark, but only after Germany's reparation debt was cancelled (Holtfrerich, 2016, p. 17). The anecdote is considered as evidence that Brüning had stubbornly subordinated the economic goal (reflation of the economy) to his dominant policy goal (the end of reparations). Political reasoning would have outstripped economic reasoning (Holtfrerich, 1990).

Here we suggest that Brüning's priority to end the reparations (foreign-currency debt) before devaluing the currency might not be totally non-economic. As the above simulation indicates, loaded with foreign-currency debt, exchange rate flexibility may not bring the much promised output stability. The answer depends on actual shocks to the German economy and the level of foreign-currency debt. A case can be made for Brüning's policy option not to float the Reichsmark.

5 Conclusion

After the U.K. devalued the pound sterling in September 1931, the German government did not devalue the Reichsmark. Instead, it intensified the policy of internal deflation in order to counteract the disadvantages in competitiveness (Büttner, 1989).

Studies take different positions concerning an alternative exchange rate policy for the Brüning government. Eichengreen (1994), whose research suggests that exchange rate devaluation was the key to recovery from the Great Depression, states that devaluing the Reichsmark would not have helped, because of Germany's current account deficits, foreign debt, political instability, and memory of the 1923 hyperinflation. Abandoning the gold standard would shock public confidence and cause massive capital outflows and domestic inflation.⁸ In contrast, Holtfrerich (1996) suggests that Brüning could have followed the British pound sterling and devalued in September 1931, saving the German economy from further deflationary policies.

Participants on different sides of the debate have noticed that the existence of foreign debt might have also played a decisive role in the exchange rate policy. For instance, Büttner (1989) presents that the main reasons that the German government adhered to the gold parity of its Reichsmark, even after the devaluation of pound sterling, were twofold: concern about possible overreaction due to the experience of hyperinflation, and the saving of foreign debt payments that were denominated in pound sterling. Concern over provisions of the Young Plan played no role. Actually, contemporaries were aware that the effects of floating the Reichsmark might be limited when Germany was troubled by the foreign debt issue. Therefore, any proposal for currency depreciation was always tied with the elimination (or restructuring) of foreign debt. Borchardt reports that journalist Felix Pinner, while proposing the float of the Reichsmark, suggested to wait a suitable moment for it. "This moment might come when the impending reparation negotiations had come to a successful close." (Borchardt, 1984, p. 481). This act of currency devaluation only after the elimination of foreign debt seems to be consistent with the view that devaluation would not come to help as long as there was a high level of foreign debt.

By using a general equilibrium model and quantitative evaluation, in this paper we show that, given the historical shocks facing the German economy, the strong reservations towards floating the Reichsmark can be justified. In addition to the much-emphasized political constraints pointed out by Borchardt and others, there is also an economic constraint that makes it undesirable for Brüning's government to float the currency. This economic constraint, namely, the existence of foreign debt, undermined Brüning's room for maneuvering.

Our empirical results have implications for the evaluation of Brüning's economic fail-

⁸Albrecht Ritschl (2012) is against devaluation, not based on its effects, but based on the argument that it would be against the Young regulations and cause capital outflows.

ure. If an alternative exchange rate policy did exist that could have mitigated the economic recession and that could have been implemented by self-help and without outside help, then Brüning and his policy could not be charged over responsibility for the economic misery and the rise of Nazism, because ultimately they were a German homemade catastrophe, to borrow from the title of Ferguson and Temin (2003). On the other hand, if exchange rate devaluation would work only under the elimination of foreign debt, then there is an argument for renegotiation of the reparations, and the need for policy coordination between Germany and the creditor countries. External factors matter. The crisis might not have been prevented, but at least the choice facing the Weimar government would have been more favorable. The empirical results of this paper are more in line with the latter interpretation.

Our results (as shown in Figure 3) have implications for any member of a monetary union and for a country that commits itself to the convertibility of its currency to a foreign currency, and more specifically for discussion on the current Greek crisis. Standard textbooks on monetary unions, such as De Grauwe (2016), consider that Greece, by being a member of the Eurozone, is deprived of an independent monetary policy to counter the economic recession. If Greece were not a member of the Eurozone and had its own currency, then a depreciation of its currency would help to stimulate its economy. This statement, according to our simulation, is only half-true. Even if Greece had its own currency, simple currency depreciation would not help to obtain the much-desired output stability. A precondition for the success of currency depreciation is to avoid balance sheet effects. Therefore, debt relief must be an integrated part of any currency depreciation plan for that program to work effectively.

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Table 1: A Chronology of the Era Brüning

Date	Event
March 12, 1930 (c)	The Reichstag ratified the Young Plan.
March 27, 1930 (c)	Hermann Müller resigned and Heinrich Brüning was appointed Reichskanzler on 29 March 1930.
July 16, 1930 (e)	Enacting the fiscal measures by 2 emergency decrees. Rejected by the German parliament two days later.
July 18, 1930 (e)	Hindenburg dissolved the Reichstag and set an election on September 14, 1930.
July 26, 1930 (e)	Issuing emergency decree: Verordnung zur Behebung finanzieller, wirtschaftlicher und sozialer Notstände
September 14, 1930 (e)	After the election, the Nazi party became the second-strongest party in the Reichstag.
September 20, 1930 (a)	The cabinet asked Hans Luther, then Reichsbank President, to negotiate for an intermediate credit of \$125,000,000.
October 11, 1930 (a)	Lee, Higginson and a group of American financial houses concluded a loan to Germany. This was the last substantial foreign credit that the Weimar Republic was to receive.
December 1, 1930 (b)(e)	Notverordnung zur Sicherung von Wirtschaft und Finanzen 1
June 5, 1931 (b)(e)	Notverordnung zur Sicherung von Wirtschaft und Finanzen 2
June 20, 1931 (e)	President Herbert Hoover offered Germany a one-year moratorium on all intergovernmental debt.
October 6, 1931 (b)(e)	Notverordnung zur Sicherung von Wirtschaft und Finanzen 3
December 8, 1931 (b)(e)	Notverordnung zur Sicherung von Wirtschaft und Finanzen 4
February, 1932 (d)	German unemployment reached its peak.
May 30, 1932 (d)	Heinrich Brüning resigned.
June 16 to July 9, 1932 (d)	Lausanne Conference; end of German reparations.
June 15, 1932 (b)(e)	Notverordnung zur Sicherung von Wirtschaft und Finanzen 5
January 30, 1933 (d)	Adolf Hitler was appointed Reichskanzler.

Sources: (a) Bennett (1962); (b) Albers (1976); (c) Klausinger (1998); (d) Kolb and Schumann (2013); (e) Holtfrerich (2016).

Note: Brüning served as Reichskanzler from 30 March 1930 to 30 May 1932.

Germany had already been in recession for more than 1 year when Brüning took

office. The Notverordnung zur Sicherung von Wirtschaft und Finanzen 5 was prepared by Brüning, but was only put into force after his resign under his successor.

Table 2: Calibrated Parameter Values

Parameter	Range	Value	Method of calibration
δ	$0 < \delta < 1$	0.80	We calibrate the parameter so that the steady-state ratio of debt to net worth is equal to 4.5879, and the risk premium is equal to 3.5%.
θ	$1 < \theta$	100	Ibid
α	$0 < \alpha < 1$	0.35	Capital share in the production of domestic goods
ρ	$0 < \rho$	0.04	Equilibrium world real interest rate
μ	$0 < \mu$	0.02	Sensitivity of country risk premium
χ	$0 < \chi$	0.50	Elasticity of world demand for domestic goods
β	$0 < \beta < 1$	0.99	Equilibrium real interest rate is 4%
γ	$0 < \gamma < 1$	0.60	Share of domestic goods in consumption
ε	$0 < \varepsilon < 1$	0.40	Inverse of elasticity of money demand
σ	$1 < \sigma$	2	Elasticity of substitution for labors
ν	$1 < \nu$	2	Elasticity of labor supply
ρ_x	$0 < \rho_x < 1$	0.90	Autoregressive coefficient
ρ_ρ	$0 < \rho_\rho < 1$	0.90	Autoregressive coefficient
θ_p	$0 < \theta_p < 1$	0.75	Degree of price rigidity
θ_w	$0 < \theta_w < 1$	0.75	Degree of wage rigidity

Table 3: Calibrated Parameter Values

θ	ψ	η
20	0.3009	0.0053
120	5.5616	0.0383
220	10.1411	0.0494
320	14.4026	0.0562
420	18.4535	0.0612
520	22.3470	0.0650
620	26.1149	0.0682
720	29.7786	0.0709
820	33.3531	0.0733

θ : Elasticity of substitution between domestic goods

ψ : Steady-state ratio of foreign debt to net worth

η : Steady-state country risk premium

Table 4: Correlation between Actual and Predicted Real GDP and CPI, Medium Value

	Real GDP			CPI		
Correlation (p-value)	Actual	Prediction: based on export demand shocks	Prediction: based on interest rate shocks	Actual	Prediction: based on export demand shocks	Prediction: based on interest rate shocks
1926Q3-1938Q3						
Actual	1.00			1.00		
Prediction: based on export demand shocks	0.33 (0.02)	1.00		0.85 (0.00)	1.00	
Prediction: based on interest rate shocks	0.35 (0.02)	-0.74 (0.00)	1.00	-0.30 (0.04)	-0.79 (0.00)	1.00
1930Q1-1934Q4						
Actual	1.00			1.00		
Prediction: based on export demand shocks	0.74 (0.00)	1.00		0.80 (0.00)	1.00	
Prediction: based on interest rate shocks	-0.20 (0.40)	-0.78 (0.00)	1.00	0.27 (0.26)	-0.42 (0.07)	1.00

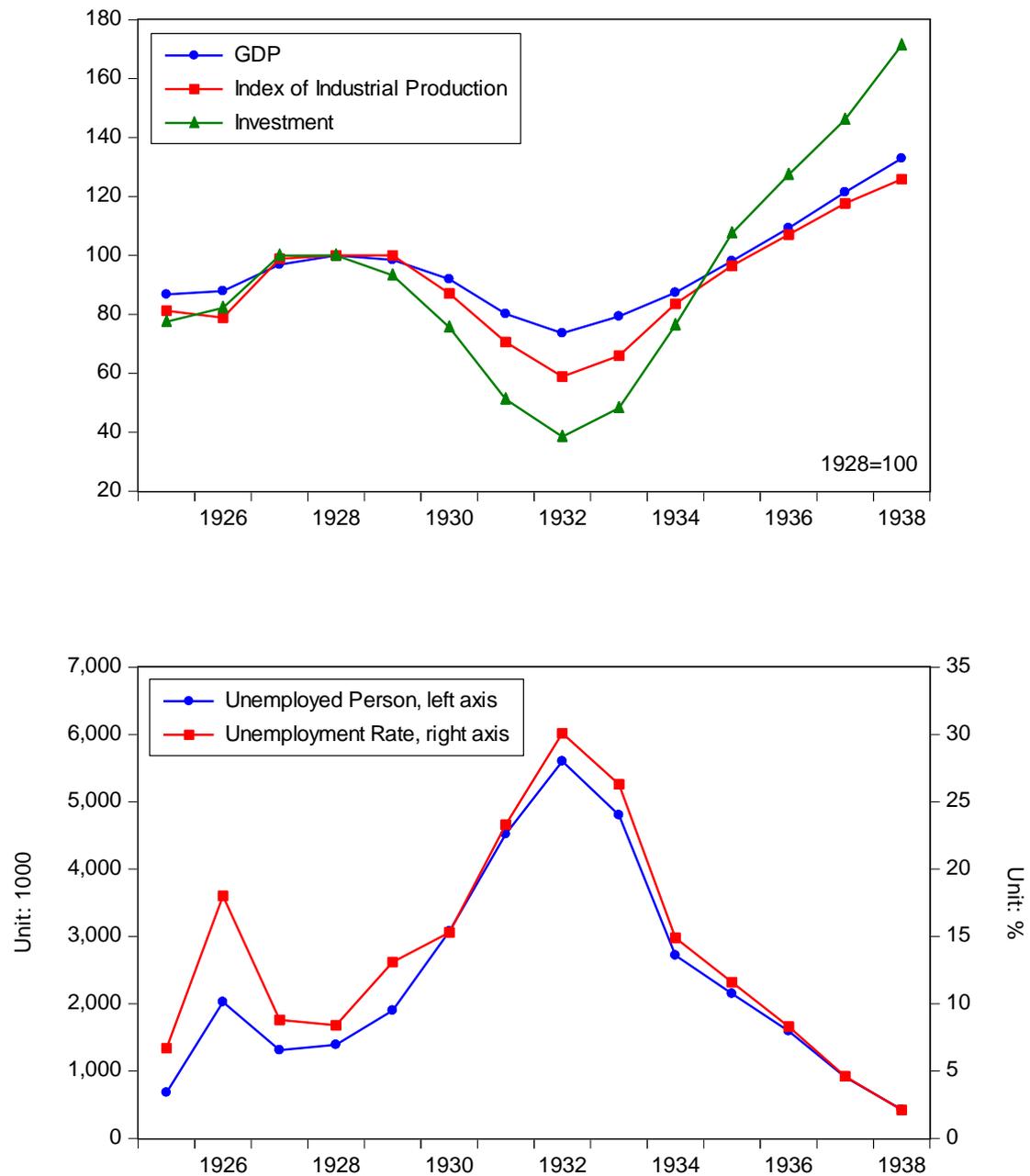
Note: Numbers in parentheses denote p-value.

Table 5: Simulated CPI Inflation under Fixed and Flexible Exchange Rates

ψ	Float		Fixed		Float		Fixed	
	1930Q2- 1934Q4				1930Q2- 1932Q2			
	Mean (%)	STD	Mean (%)	STD	Mean (%)	STD	Mean (%)	STD
0.3009	2.7	0.084	-4.7	0.050	7.9	0.030	-7.0	0.035
5.5616	2.1	0.080	-4.6	0.049	7.3	0.027	-6.7	0.035
10.1411	1.6	0.080	-4.4	0.048	7.0	0.024	-6.5	0.034
14.4026	1.1	0.082	-4.2	0.047	6.8	0.024	-6.2	0.034
18.4535	0.6	0.085	-4.1	0.046	6.6	0.025	-6.0	0.033
22.3470	0.1	0.089	-3.9	0.045	6.3	0.027	-5.8	0.032
26.1149	-0.1	0.094	-3.7	0.045	5.9	0.031	-5.7	0.032
29.7786	-1.2	0.100	-3.6	0.044	5.5	0.036	-5.5	0.031
33.3531	-1.9	0.108	-3.4	0.044	5.0	0.042	-5.4	0.030

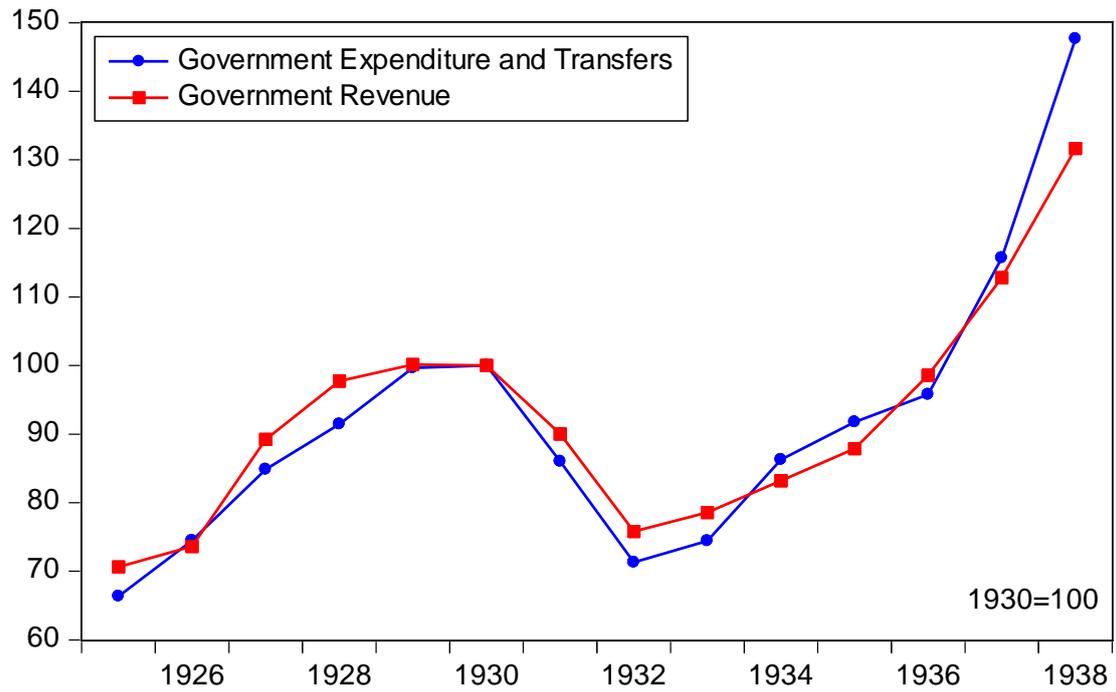
Note: STD refers to standard deviation.

Figure 1: Germany's Economic Indicators, 1925-1938



Sources: GDP (Ritschl and Spoerer, 1997); Index of Industrial Production (Palgrave Macmillan Ltd, eds., 2013); Investment (Ritschl, 2002); Unemployment Person (Rahlf, 2015); Unemployment Rate (Rahlf, 2015). GDP, Index of Industrial Production, and Investment have been normalized so that their values in 1928 are equal to 100.

Figure 2: Germany's Public Finance, 1925-1938



Sources: Government Expenditures and Transfers (Ritschl, 2002); Government Revenue (Ritschl, 2002); Population (Statistisches Bundesamt, 1972). Government Expenditures and Transfers and Government Revenue are first divided by Population, and then normalized so that their values in 1930 are equal to 100.

Figure 3: Impulse Response to a Negative Export Demand Shock

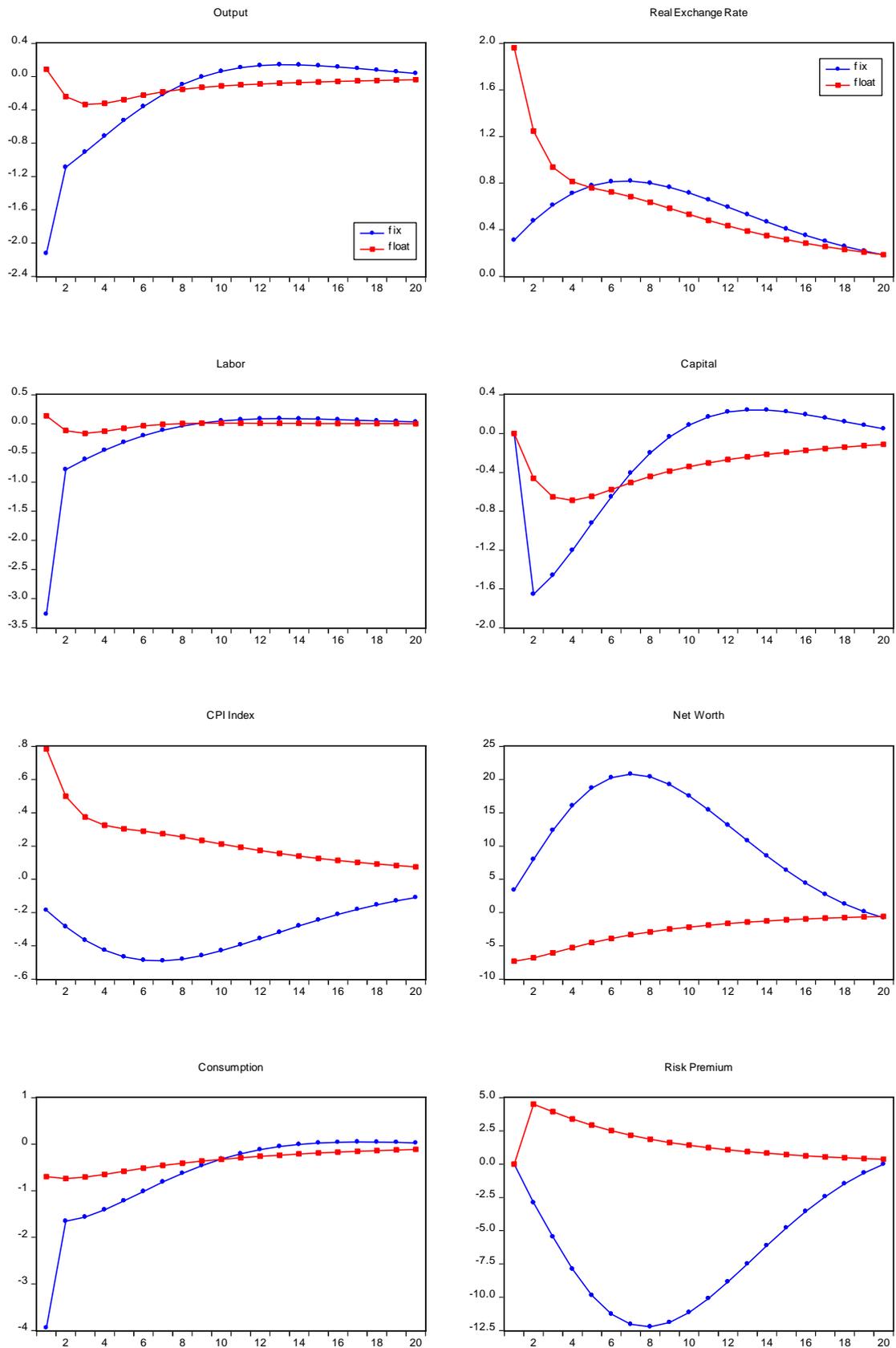


Figure 4: German Real GDP, CPI, and Structural Shocks

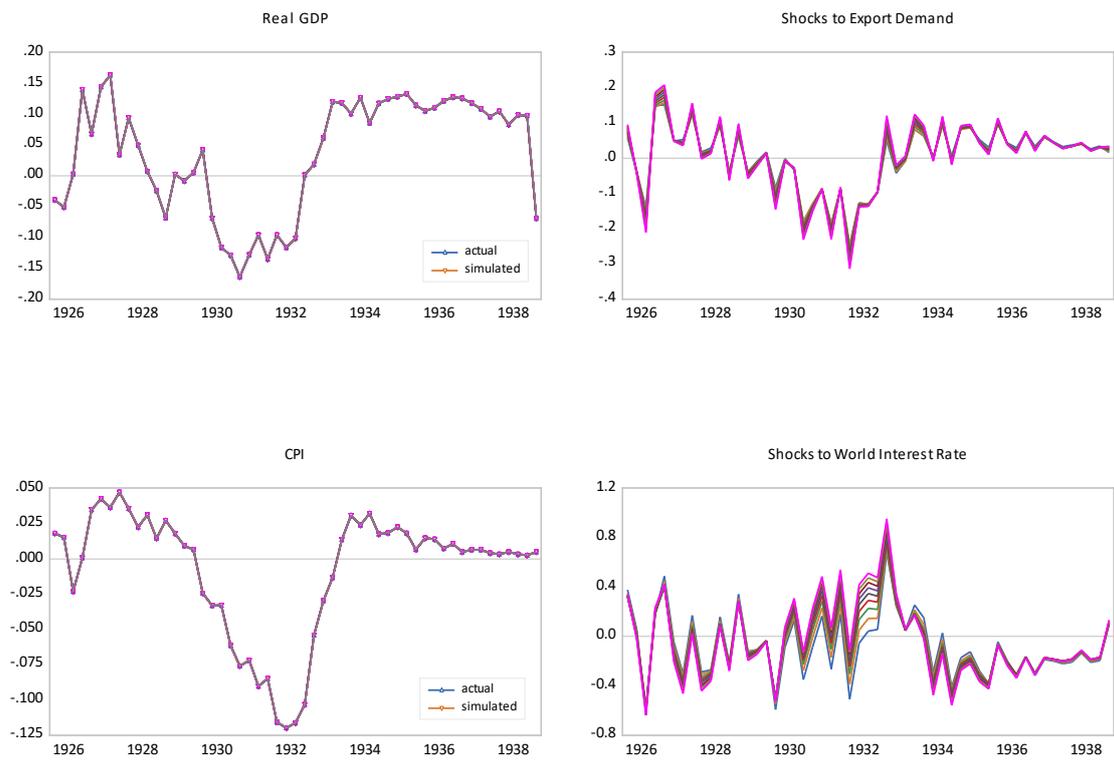


Figure 5: Prediction of German Real GDP and CPI using a Single Structural Shock

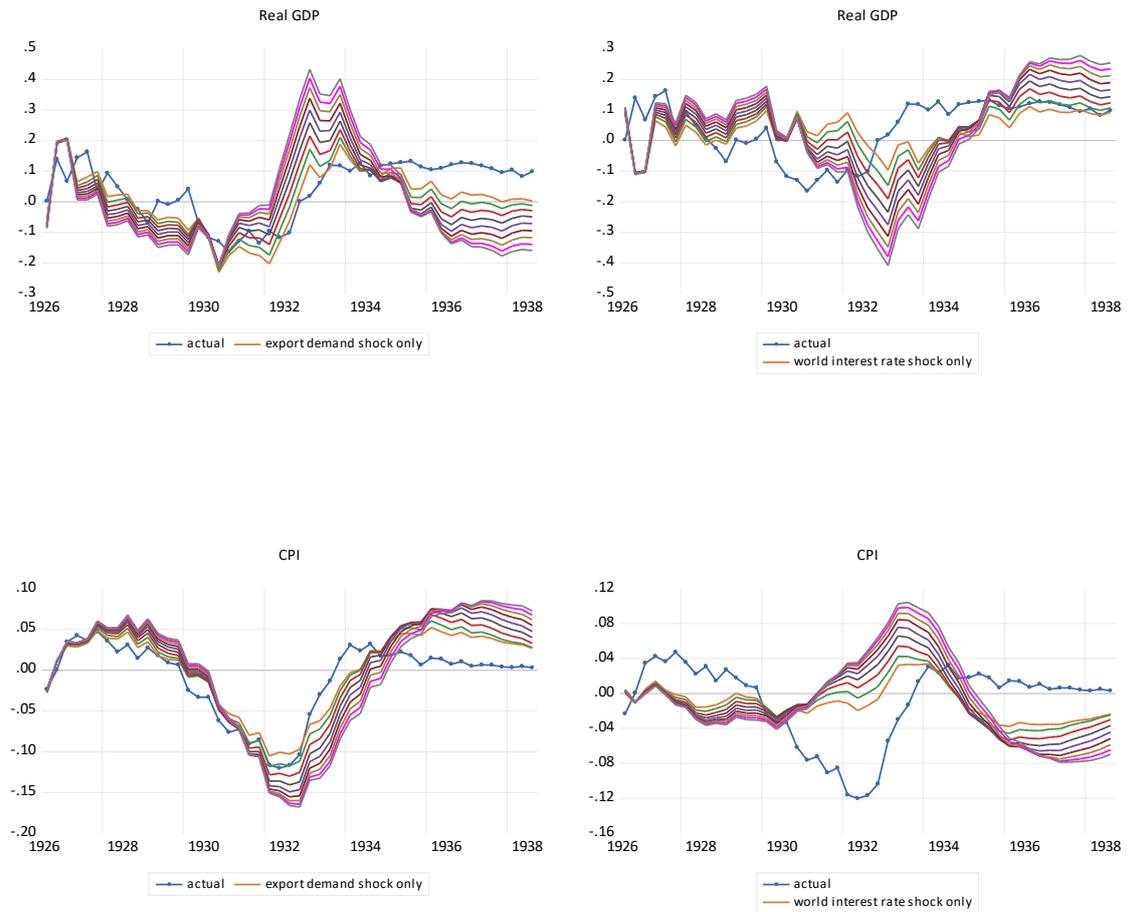


Figure 6: Performance of Alternative Exchange Rates, Given Historical Shocks

