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Original sin and the great depression☆

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ABSTRACT

Do exchange rate movements matter for how markets price foreign currency denominated sovereign bonds? High-frequency bond price data from 1931 show that depreciation against the dollar/gold was associated with elevated risk premia on US dollar/gold public debt. We use a theoretical model to illustrate how foreign currency debt influences exchange rate policy and foreign currency bond prices. We use these theoretical results, the timing of sterling's devaluation in September 1931, and historically determined fundamentals to identify the impact of exchange rate policy on hard-currency bond yields in the Great Depression.

1. Introduction

A leading view of the Great Depression concludes that devaluation stimulated economic recovery (Eichengreen, 1992). Eichengreen and Sachs (1985) and Campa (1990) showed empirically that the pace of economic growth in the 1930s depended crucially upon devaluation. Countries that delayed going off gold had weaker growth, lower exports, and lower investment rates. The costs of pegging to gold, the *status quo ex ante*, were seemingly higher than the benefits of exiting the peg.

Nevertheless, exit from the gold standard was remarkably slow for many countries. Only a small number of financially weak commodity-exporting nations had devalued in the two-and-a-half years between early 1929 and September 1931. Great Britain waited until September 1931 to devalue. The US did so only in 1933. France, Switzerland, Belgium and the Netherlands waited

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even longer. Many countries followed either Britain or the US examples. Why did countries wait to go off the gold standard? Why did some countries follow the leaders off gold and then re-peg their currencies to these leaders if fixed exchange rates constrained monetary policy? We argue that the currency denomination of debt played a role.

Our first contribution in this paper is to quantitatively explore how much the currency denomination of debt was a constraint on exchange rate and monetary policy during the Great Depression. Instead of focusing on the binary choice to leave gold or not, we re-frame the issue. How did policy makers and markets assess the tradeoffs associated with exchange rate stability with selected anchor nations like the USA and Great Britain?

Currency denomination of debt has so far escaped a cross-country quantitative analysis in the Great Depression period.[1] Eichengreen and Hausmann (2005) highlight the origins, implications, and importance of foreign currency debt in recent decades.[2] Historically, governments, firms, banks, and households frequently contracted repayment of debt in gold or in a fixed amount of foreign currency. Currency denomination of debt was a paramount consideration for exchange rate policy based on our reading of a range of secondary and contemporary sources and empirical evidence presented here.

While some of the country case studies for the 1930s have addressed the issue, the comparative quantitative literature largely has not. Bordo and Redish (1990) emphasize that in Canada devaluation entailed a potential loss of credibility. Research by Simmons (1994), Wandschneider (2008), and Wolf (2008) explores the comparative determinants of devaluation in the 1930s. The emphasis is on the balance of payments, trade relations, political economy, and economic ideology. These papers mainly discuss devaluation in terms of its anticipated domestic macroeconomic effects. Wandschneider (2008) and Wolf (2008) explicitly investigate the impact of bilateral trade relationships, and many other variables on the timing of devaluation. Foreign currency debt is a notable omission in their combined list of determinants.

To help understand the endogeneity of exchange rate policy to foreign currency debt, we adapt a simple, static theoretical model based on Bénassy-Quéré (1996). The stylized model shows how foreign currency debt and trade linkages might plausibly affect desired exchange rate fluctuations. We then add to this model an exploration of how bond markets might react to exchange rate policy shocks. We then use the equilibrium relationships from the model to guide and discipline our empirical framework.

Theory suggests and empirics show that governments tended to limit exchange rate movement between 1925 and 1938 against those currencies in which their debt was denominated. Trade also plays a role. This observation partially rationalizes why some countries opted to devalue but to continue pegging to sterling after 1931 whilst others, those carrying greater US dollar debt, were more inclined to follow the dollar and US monetary policy.

The second contribution of this paper is to investigate how markets priced foreign currency denominated sovereign debt in light of the dramatic exchange rate re-alignments that emerged in late 1931. Financial markets in London and New York responded to depreciation against gold currencies by requiring relatively higher yields on bonds denominated and repayable in gold-pegged currencies like the US dollar.

We find that higher bond yields on hard currency debt were associated with devaluation in the early 1930s. This is consistent with the idea that financial markets believed that devaluation raised sovereign default risk in the presence of foreign currency debt. Our framework also allows for the fact that exchange rate choices naturally had implications for economic recovery, trade patterns, and capital flows.

The theoretical model illustrates the potential for simultaneity bias in regressions relating the bond yield to the exchange rate. To deal with this, we are guided by our theoretical model and policy changes in leading countries exogenous to smaller economies. Specifically, we use the sudden devaluation of sterling in mid-September 1931 as a natural experiment. In reaction to this policy shock, other small open economies had to decide how to manage their exchange rates. Their responses were partially driven and conditioned by the historically determined currency denomination of debt and trade patterns. As our model shows, this shock, and the historical drivers of financial and trade linkages help us to cleanly identify the impact of nominal exchange rate changes on perceptions of sovereign risk.

Using a new, hand-collected dataset on bond yields at the weekly and daily frequency, currency denomination of debt, and exchange rates, we find that markets penalized devaluation for debtors which had contracted debt in strong currencies like the US dollar. Higher bond yields compensated investors for the heightened risk of default due to adverse exchange rate movements.

Our paper also contributes by building the case that foreign currency debt and financial instability were an important, but relatively neglected feature driving patterns of recovery from the Great Depression. The leading narrative of the Great Depression is that devaluation was largely a beneficial policy choice. Ex post, or at least today, this may seem obvious, but ex ante, and historically it was not obvious at all (Eichengreen, 1992). Indeed, there was significant debate, across a wide range of countries, about the merits of devaluation versus other policies at the time. Official data suggest that the average ratio of foreign public debt to total public debt for a large set of countries was close to 60% in 1930. Despite the ubiquitous and recurrent nature of the problem, external debt issued and payable in foreign currency is not traditionally emphasized as a significant constraint or problem in the 1930s. Nor has the literature offered an assessment of how financial markets viewed the decision to devalue as a function of hard currency debt, or otherwise.

[1] Eichengreen (1992, ch. 10) highlights many of the issues and tradeoffs discussed in this paper and supplies a bevy of narratives on country experiences. Our paper goes beyond his analysis by studying high frequency financial market data on bond yields and empirically exploring an explicit theoretical economic model of exchange rate policy with cross-country data.

[2] Even today, although the issue has abated somewhat, it has not completely disappeared (McCauley et al., 2015; Alfaro et al., 2019).

We follow a line of research in international finance that emphasizes the potentially contractionary effects of depreciation in the face of foreign currency debt. Eichengreen and Hausmann (1999) highlight the issue in the East Asian financial crisis. More recent events are also related to this issue (Verner and Gyöngyösi, 2020). Theoretical work by Céspedes et al. (2003) suggests that devaluation can have negative output effects when foreign currency debt makes up a significant fraction of the total, when leverage is high, and when the responsiveness of exports to depreciation is low.

Consistent with this literature, our preliminary examination of data from the 1930s suggests high shares of foreign currency debt in total (sovereign) debt led nations to delay devaluation. In some sense, this rationalizes how, even if the gold standard was ultimately a detriment to recovery, why policy makers were sometimes hesitant to devalue. It also sheds light on the path countries followed subsequent to devaluation. Why did countries choose to continue pegging to one currency or another if they had already abandoned the idea of the gold standard and its constraints on monetary policy?

Our conclusions are that foreign currency debt was an important constraint on exchange rate policy throughout the 1930s, and financial markets were skeptical of devaluation in proportion to the amount of gold debt previously contracted. Once major nations, which themselves did not suffer from original sin devalued, or debt had been eliminated via repayment or, even later, with default, emerging markets were somewhat more liberated from the constraints of the gold exchange standard. In the meantime, nations tended to maintain exchange rate stability against the currencies in which their debt was denominated which likely exacerbated the economic downturn. The "public good" or externality associated with devaluation and monetary policy by leading nations is a key to understanding global economic downturns like the Great Depression.

2. Currency mismatch, exchange rates, and sovereign risk in the interwar global economy

Eichengreen and Hausmann (2005) call borrowing in foreign currency on international markets *original sin*. They noted that advanced and low income countries alike borrow in foreign currency. In the interwar period, countries, banks, firms, and households also frequently borrowed in foreign currency in New York and London rather than in domestically issued currency. We observe that all sovereign and corporate debt floated in New York in the 1920s and early 1930s was contractually payable in gold dollars.[3]

Historically, as in the present, only a handful of leading and large countries were able to issue debt on international markets payable in their own currency (Bordo et al., 2005; Flandreau and Sussman, 2005). Although many countries issued debt domestically, which was payable in local currency, foreign debt was, and is, most often denominated in foreign currency.

What is the bond market's reaction to exchange rate movements in light of the presence of foreign currency debt? Do markets price in a higher risk of default when the exchange rate depreciates? A common argument is that exchange rate depreciation can lead to "financial crises and deep recessions" when foreign debt is denominated in foreign currency, especially when such debt remains unhedged (Aguiar et al., 2022).

We have these observations in mind when presenting a stylized model of sovereign risk, foreign currency debt, and exchange rate policy. We aim to establish a credible, but simplified theoretical model to guide our empirical investigation.

3. Debt finance, trade patterns and exchange rate policy

We first consider how exchange rate policy relates to the bond market. We modify a model of exchange rate-based stabilization of the balance of payments due to Bénassy-Quéré (1996). We focus on endogenous exchange rate policy in one small open-economy. There are also two countries that issue international currencies in which debt is denominated. We assume that trade with the two countries which issue the international currencies (or more generally these two currency blocs) accounts for all international trade flows for the first economy.

Assume there are two international currencies, sterling and the US dollar. Debt is payable in either sterling or US dollars. Both currencies initially maintain a fixed parity gold standard. A small-open economy, with its own domestic currency, issues debt which is traded in competitive markets by risk-neutral investors.

For our purposes, we will consider a short-run where the real and nominal exchange rate coincide. We assume away strategic responses by studying the policy of a small-open economy. Ratios of debt, currency shares of debt and trade, and the net export-to-GDP ratio, are pre-determined. Bond prices/interest rates are taken as given by the small open economy. The policy maker then chooses an exchange rate which affects the level of new debt financing required. The government commits to this rule, and once committed, there is a stochastic shock which also helps determine the level of new financing required and the following period's level of debt. To simplify, we hold sterling debt constant and assume new issues are in dollar debt.[4] The government has a short-time horizon and makes decisions only for the current period t without regard to the future.

We assume that the small country aims to stabilize the value in local currency terms of external financing, b, relative to its objective, b^*, by choosing the appropriate exchange rate against the US dollar and British pound. The amount of new external financing equals the difference between initial (external) debt service plus principal re-payments and the trade surplus. The gross

[3] This was true in our estimating sample which covers late 1931 and reminad true until 1935. At that point, the Supreme Court unexpectedly upheld the abrogation of the gold clauses. See Edwards (2018) for a recent analysis.

[4] The London capital market was effectively closed to new foreign issues after the summer of 1931 (Accominotti and Eichengreen, 2015, Fig. 1). They show that in 1932 all new financing was in Paris (on gold) and other gold-bloc financial centers like Amsterdam or Zurich. In our model there are only 2 international currencies, sterling and the hard currency/gold dollar. As such our assumption is consistent with the historical landscape.

interest rate charged is R_t. The government seeks to minimize the expected loss function given by

$$\Omega^{ND} = \mathrm{E}\left[\pi R_t b(e_{\$t}) - b^*\right]^2. \tag{2}$$

The parameter $\pi > 0$ represents the sensitivity of government preferences to changes in financing costs, R.

The new financing requirement, $b(e_\$)$, is simplified to the following expression which is the sum of debt service and principal re-payments and the trade balance:

$$b(e_{\$t}) = \beta f_t - (\alpha\gamma e_t + \theta_t) \tag{3}$$

where e is the logarithm of the real effective exchange rate for trade flows, f_t is the logarithm of the real effective exchange rate for foreign debt payments, α is the ratio of the trade balance relative to GDP, γ is the sum of the (absolute values) of the export and import elasticities minus 1, β is the ratio of foreign debt principal due in the current period plus debt service to GDP, and θ is a stochastic shock to the trade balance with an expected value of zero and a finite variance.

Define the real effective exchange rates for trade flows, e, and debt, f, as

$$e_t = \alpha_\$ e_{\$t} + \alpha_£ e_{£t}$$
$$f_t = \beta_\$ \, e_{\$t} + \beta_£ \, e_{£t}$$

where α_j is the share of trade by country (or more broadly invoiced in currency j) and β_j is the share of debt payments in currency $j = \$, £$. Using the fact that $\alpha_\$ + \alpha_£ = 1$, $\beta_\$ + \beta_£ = 1$, and $e_{£\$}$ (the sterling price of a US dollar) equals $e_\$ - e_£$ it is easy to show that the optimal dollar exchange rate at time t is given by

$$e^*_{\$t} = \left(\frac{\beta\beta_£ - \alpha\gamma\alpha_£}{\beta - \alpha\gamma}\right) e_{£\$t} + \frac{b^*}{\pi(\beta - \alpha\gamma)R_t}. \tag{4}$$

One can also show the optimal depreciation against the US dollar when the pound depreciates by 1% against the US dollar is given by:

$$\frac{\partial e_{\$t}}{\partial e_{£\$t}} = \frac{\beta\beta_£ - \alpha\gamma\alpha_£}{\beta - \alpha\gamma} \tag{5}$$

Eq. (5) implies that when there is no foreign debt ($\beta = 0$) or when the currency share of debt is matched to the trade flows ($\alpha_£ = \beta_£$), $\frac{\partial e_\$}{\partial e_{£\$}} = \alpha_£$. For instance, if all trade is with Great Britain, and all debt is denominated in pounds, then the optimal response to a 1% depreciation of the pound versus the dollar is to maintain a peg with sterling. The local currency would of course then depreciate against the dollar by the same amount as sterling.

Now continue to assume all debt is denominated in pounds, but trade with Great Britain is <100%. In this case, some appreciation against the pound is allowed in inverse relation to the share of trade with Britain. A country with a very low British trade share, (i.e., a very high US trade share), would peg closer to the dollar, appreciating significantly more against the pound.[5]

Generally speaking, higher shares of GBP-denominated debt or higher shares of British trade are associated with closer pegging to the pound in the wake of a sterling devaluation. Fig. 1 shows some other examples of how this part of our theoretical model works.

Fig. 2 and Fig. 3 show two simple tests of the structural model for exchange rate changes. Here we regress the log change of the exchange rate against the US dollar and the absolute value of the log change of the exchange rate against sterling on the two-year lag of the ratio featured on the right hand side of (5). The exchange rate change is measured between the end of 1931 and the end of 1932 which is the year following sterling's devaluation against gold.

Fig. 2 shows the actual values and the regression line for the nominal depreciation against the US dollar in 1932 for 13 countries/colonies. Expression (5) predicts a positive relationship with a coefficient equal to the size of the British devaluation against the dollar (roughly 0.25 log points). The coefficient of 0.37 in this regression is somewhat higher than predicted. The heteroscedasticity robust standard error is 0.27 (p-value = 0.19). The R-squared is 0.08. We recognize the issues of the small sample here.

Fig. 3 shows the absolute value of the actual and predicted changes against sterling between 1931 and 1932. The predicted negative relationship is evident.[6] The coefficient in the regression of the absolute change in sterling against the dollar is −0.44 with a heteroscedasticity robust standard error of 0.15 (p-value = 0.014). The R-squared of the regression is 0.52.

Several regression tables show some of the broader correlates of exchange rate policy at the time as a way of checking whether trade and debt flows matter after controlling for other factors. Table 1 uses a panel sample of 17 countries and studies

[5] Also note that when $\alpha\gamma \approx \beta$, that is, when trade is nearly balanced against debt re-payment the optimal response is indeterminate. In this case, exchange rate variations have offsetting effects on the trade flows and debt repayments.

[6] Here the model predicts a negative relationship since a peg to the dollar would necessarily imply an appreciation against the pound equal in percentage points to sterling's depreciation against the dollar. This depreciation was 25 log points in 1932. A predicted peg to sterling implies a 25 log point depreciation against the dollar.

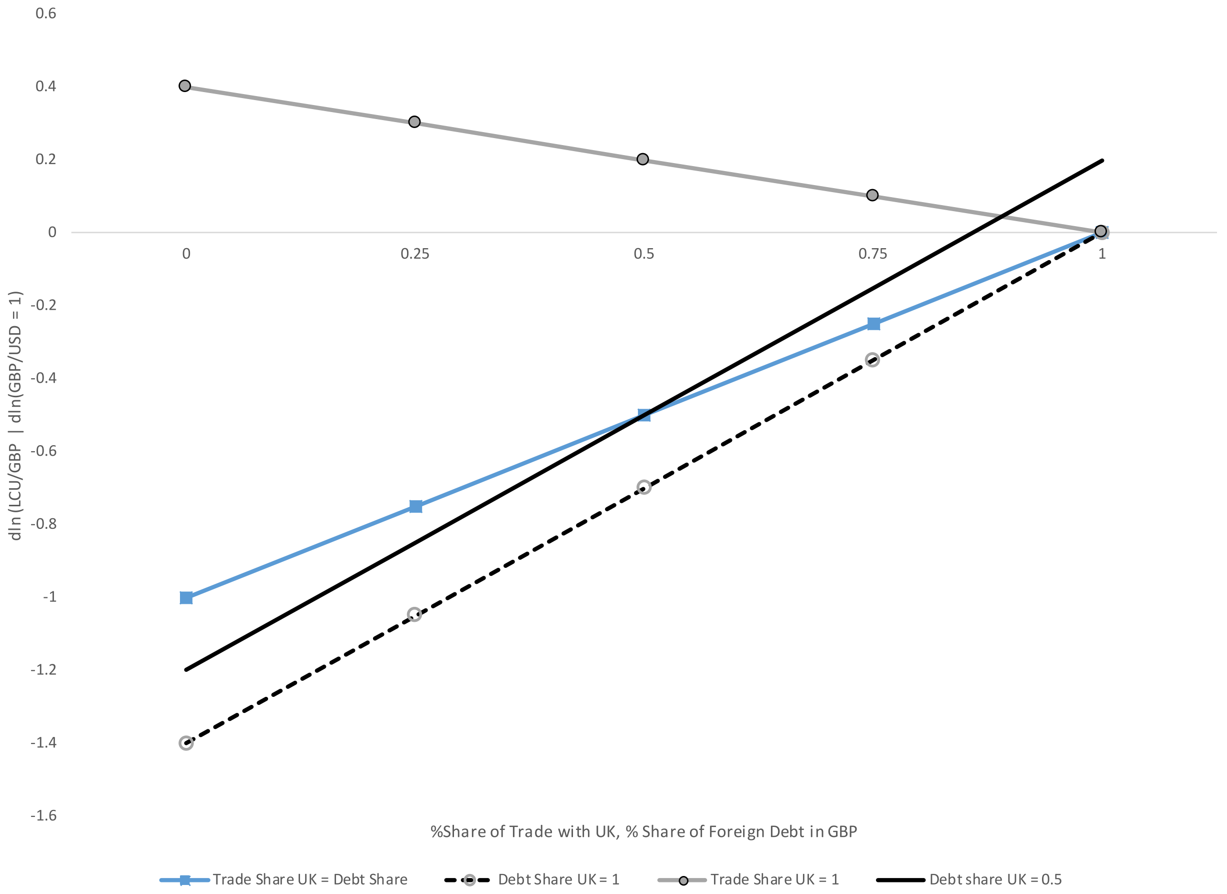

Fig. 1. Simulated Values for the Theoretical Exchange Rate Model with Different Trade and Debt Shares.
Notes: Graph shows predicted exchange rate change against the pound for the model explored in Section 3. The model is parameterized as per the text. Each line holds either the share of debt denominated in GBP or the share of trade with Great Britain constant while allowing the other share to vary along the x-axis. One line labelled (Trade Share UK = Debt Share) allows both shares to move together between 0 and 1. The y-axis shows the predicted change of the local currency against the pound in percentage terms (x 100) for a 1% depreciation of sterling against the dollar. Negative values are appreciations against the pound. A movement of 0 against sterling is a peg to sterling.

the absolute value of the bilateral movement for a country s in the (nominal) exchange rate against the currency of anchor country j (Britain or the US). The model includes trade and GBP or USD debt. We are able to include country fixed effects, year fixed effects which control for common shocks, or country by year fixed effects for country-specific trends. We allow trade and debt to be with country j or denominated in the currency of country j = GB, USA. This model is expressed as:

$$\left|\Delta \ln\left(e_{sjt}\right)\right| = \exp\left[\gamma_o\left(\frac{T_{sjt}}{Y_{st}}\right) + \gamma_1\left(\frac{Debt(j)_{st}}{Exports_{st}}\right) + X_{st}\phi + \delta_t + \mu_s\right] + \varepsilon_{sjt} \tag{6}$$

where T_{sj} represents trade for country s with the US or UK (j), δ_t are year fixed effects, and μ_s are country fixed effects. We also include controls for membership in the British Empire and the bilateral deviation of nominal GDP from the anchor country in the vector X. We run Poisson PPML regressions due to the limited dependent variable. The general prediction is that a country would peg closer to a currency like the dollar or pound when trade or debt linkages were higher, *ceteris paribus*. The results indicate that the significant determinants of fixed exchanges (vis-à-vis the dollar and pound) include trade and debt with the US and the UK. Both of these are negatively associated with exchange rate movement with the respective anchors.

We have included two cross-sectional regressions and three panel regressions. The cross-sections are for 1932 which is the year after sterling left gold and the year before the US left the gold standard. The panel includes all years between 1928 and 1939 and includes year, year and country fixed effects, or year and country-year fixed effects.

Using our most saturated model in column (5), a one standard deviation rise in the trade ratio (8 percentage points) is associated with an 11 log point decline in exchange rate movement (equivalent to a little over one standard deviation of the dependent variable). This coefficient is only significant at the 7% level in column (5). Meanwhile, a one standard deviation rise in the

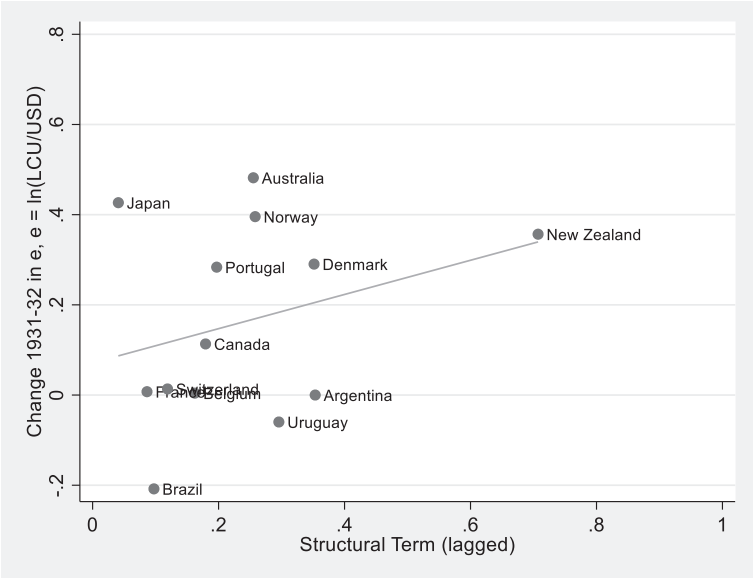

Fig. 2. Change in the USD Exchange Rate against the Policy Rule.
Notes: This chart shows the bivariate OLS regression of the change in the (log of) the US dollar exchange rate (local currency per US dollar) against the two-year lag of the policy rule from the theoretical model described above and a constant. The policy rule is a function of the trade share, trade elasticities, debt shares etc. See the text for a description and Appendix A.1 for sources.

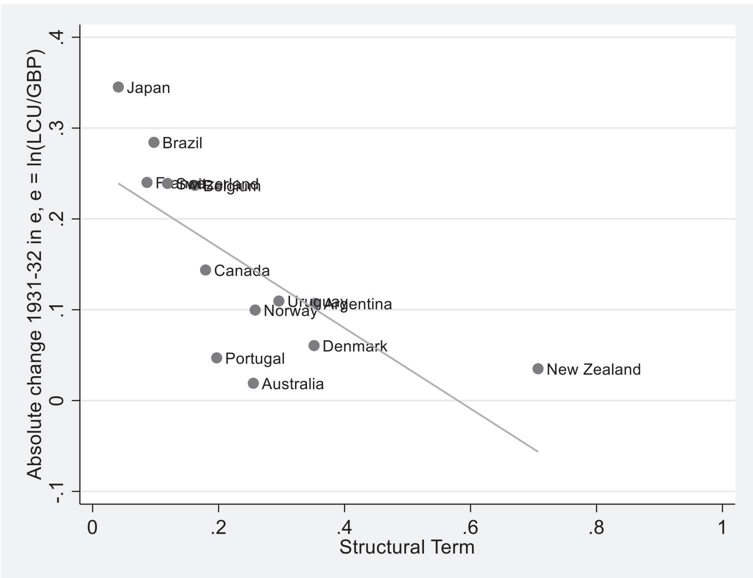

Fig. 3. Change in the GBP Exchange Rate against the Policy Rule.
Notes: This chart shows the bivariate OLS regression of the absolute value of the change in the GBP exchange rate (local currency per GBP) against the two-year lag of the policy rule from the theoretical model described above and a constant. The policy rule is a function of the trade share, trade elasticities, debt shares etc. See the text for a description and Appendix A.1 for sources.

currency denomination of debt-to-GDP ratio (38 percentage points or 0.38) is associated with a 0.41 standard deviation decline in the dependent variable. The absolute value of the bilateral deviation of nominal GDP from the anchor is significant at the 11% level and a one standard deviation rise is associated with a 0.64 standard deviation increase in the dependent variable. Membership in the British Empire is not a statistically significant determinant of bilateral exchange rate stability against the pound but the

Table 1
Absolute Changes in Bilateral Exchange Rates against the US dollar and the British pound, 1928–1939, Cross-Sectional and Panel Models.

	1932	1932	1928–39	1928–39	1928–1939
	(1)	(2)	(3)	(4)	(5)
Bilateral Trade/GDP	−4.80**	−4.91	−1.96	−0.89	−1.40*
	[1.89]	[3.53]	[1.38]	[0.98]	[0.79]
Bilateral Debt/GDP	0.14	0.28	0.10	−0.23***	−0.11
	[0.24]	[0.28]	[0.15]	[0.07]	[0.09]
British Empire x I(j = UK)	−0.72	−0.59	−0.74***	−0.43	−0.42
	[0.53]	[0.74]	[0.20]	[0.33]	[0.32]
ln (Nom. GDP_{it}/Nom. $GDP_{UK/USA,\ t}$)	0.03	0.06	0.01	0.05*	0.04
	[0.06]	[0.24]	[0.03]	[0.03]	[0.03]
Observations	32	32	457	457	457
Number of Countries	17	17	17	17	17
Country Fixed Effects	N	Y	N	Y	N
Year Fixed Effects	N	N	Y	Y	Y
Country x Year Fixed Effects	N	N	N	N	Y

Notes: Dependent variable in the regression is the absolute change in the logarithm of the GBP exchange rate (local currency units per GBP) or the USD exchange rate. Independent variables are lagged by one year. Estimation is by Poisson PPML. Coefficients are reported. Robust standard errors, clustered at the pair and country level are in brackets. *** p-value <0.01; ** *p*-value <0.05; * *p*-value <0.10.

coefficient is negative. Overall evidence is consistent with the idea that bilateral debt and trade, as well as output co-movement were of concern for exchange rate policy.[7]

4. Bond pricing/sovereign risk

To understand how default risk and bond yields are related to the government's exchange rate choice, we follow a simple example of debt dynamics and default risk based on Lorenzoni (2014). The government will follow a rule regarding default which focusses the discussion on investor sentiment about default conditional on actions taken by the government.

At the start of each period, the government inherits external debt repayments in dollars and sterling (principal and interest) relative to GDP and expressed in local currency of $\beta f_t \equiv D_t$. The government runs a trade surplus relative to GDP equal to $\alpha\gamma e_t + \theta_t \equiv S_t + \theta_t$. The first part of the surplus, S_t, is pre-determined, as per the model above. The government budget constraint if there is no default is $Q_t D_{t+1} = D_t - (S_t + \theta_t)$

The bond price, Q_t, satisfies

$$Q_t = \frac{1}{1+\bar{r}_t}\Pr[\text{repayment in period } t+1] \tag{7}$$

where $\bar{r}_t$ is the real risk-free interest rate, and we assume that under default no debt is re-paid.

The value of current net financing, after exchange rate choices are decided and the shock is revealed, is given by $b\left(e^*_{\$t}\right) = D_t - (S_t + \theta_t)$. As in Lorenzoni (2014), we seek to establish an equilibrium, conditional on $b\left(e^*_{\$t}\right)$. When $b\left(e^*_{\$t}\right)$ exceeds a threshold, $\bar{b} > 0$, the bond price goes to zero, a government cannot finance its debt, and default occurs. For sufficiently low $b\left(e^*_{\$t}\right)$, $\underline{b}$, the government will for sure repay and the bond price equals $\frac{1}{1+\bar{r}_t}$. For $b\left(e^*_{\$t}\right)$ in the interval $\left(\underline{b}, \bar{b}\right)$ there is a positive probability of default in the next period, since debt is now larger and the bond price must be in the range $\left(0, \frac{1}{1+\bar{r}_{t.}}\right)$

We establish the existence of an equilibrium given $\bar{b}$ and where there is a positive probability of default at that level of net financing. The probability of default is $F(Q_t D_{t+1})$, since the government will repay if $Q_t D_{t+1} \le \bar{b}$. Under rational expectations, and using the fact that θ_t has a mean of zero, the equilibrium bond price solves the following equation:

$$Q_t = \frac{1}{1+\bar{r}_t}\left(1 - F\left(\frac{D_t - S_t}{Q_t} - \bar{b}\right)\right) = \frac{1}{1+\bar{r}_t}\left(1 - F\left(\frac{\beta f^*_t - \alpha\gamma e^*_t}{Q_t} - \bar{b}\right)\right). \tag{8}$$

A depreciation of the local currency against the dollar can raise default risk. More specifically, it can be shown that for a given pound-dollar exchange rate, $e_{£\$t}$, the equilibrium bond price is decreasing in the dollar exchange rate $e_\$$ when the condition $\beta > \gamma\alpha$ holds. This condition obtains when the external debt-service-to-GDP ratio exceeds the trade surplus-to-GDP scaled by

[7] Appendix Table B1 shows exchange rate models with a number of other controls including the change in (the log of) reserves, a default indicator, the output gap compared to 1928, and the trade balance. These models show that debt and trade factors were about half as strong on average as the output gap in the early 1930s in determining exchange rate movement. In Table B2 we used values for controls in 1929 to alleviate endogeneity. Results are qualitatively in line with other results in Table 1 and B1.

the exchange rate elasticity term. When this condition holds, the interest rate on new debt issues is positively related in the short-run to the (real) US dollar exchange rate.

When the opposite condition holds, $\beta < \gamma\alpha$, depreciation can reduce default risk since depreciation stimulates exports and/or the external debt burden is sufficiently low. In a richer model, depreciation could be associated with inflation, a decline in the burden of internal debt, enhancement of export profitability, etc. all of which could stimulate output and relax resource constraints to help service the debt. These issues were highlighted in contemporary discussions of the impact of the new British exchange rate policy in *The Economist* (September 26, 1931 p. 571). We leave these issues for further research.

The fixed point solution to eq. (8) may not be unique, as highlighted in Lorenzoni (2014). In this case, it is possible to envision a scenario where investors become "pessimistic" leading to a higher risk premium at a given level of net financing. While these debt dynamics are important, we wish to abstract from them for the moment and emphasize the relationship between the equilibrium bond yield and the dollar exchange rate.

5. Model solution and equilibrium

An equilibrium in our theoretical framework consists of an optimal dollar exchange rate and bond price/yield. The small, open economy optimizes taking British exchange rate policy against the dollar and the market's bond price/yield as given. Bond markets compete returns away until expected returns on a given sovereign bond issue equal the world-risk free rate.

Fig. 4 shows a stylized, graphical solution to the theoretical model. We work with bond yields instead of bond prices, since yields are somewhat more appropriate for the empirics below. The *BY* line uses eq. (8). This "bond yield" equation shows that bond yields are monotonically increasing in the US dollar exchange rate under the assumption made above that $\beta > \gamma\alpha$. For bond pricing, we assume stochastic shocks to the trade surplus have a normal distribution. This positive relationship is the main testable assumption of the empirical exercise below.

Line *FX* is based on Eq. (4). Assuming that $\beta > \gamma\alpha$, *FX* shows that the optimal dollar exchange rate change is negatively related to the (gross) interest rate, $R_t = \frac{1}{Q_t}$. The relationship is monotonically decreasing. When the parameter $\pi \to 0$, the *FX* relationship becomes vertical. To prove existence, a sufficient condition is that the y-intercept of the *FX* line lies above the *BY* line when the probability of repayment equals 1 or when the following condition holds: $\left(\frac{\beta\beta_{£}-\alpha\gamma\alpha_{£}}{\pi(\beta-\alpha\gamma)}\right)e_{£\$t} > 1+\bar{r}_t$. This condition easily holds for plausible combinations of the parameters and a calibration using sample means.[8] Having established that the *FX* curve can intersect the *BY* curve from above is sufficient to prove the existence of an equilibrium in this model.

6. Identification & simultaneity

We are interested in identifying the average effect of depreciation on sovereign bond yields. The driver of the local dollar exchange rate is a policy shock to the pound/dollar exchange rate. This policy shock raises $e_{£\$t}$ shifting the *FX* equation up according to eq. Eq. (4). The magnitude of the shift depends on the trade and debt shares. Recall that if the debt and trade share with the pound bloc are equal, then there is always a positive shift leading to a higher equilibrium yield.

The problem of identifying the sensitivity of the bond yield to the local dollar exchange rate, or the slope of *BY*, in a simple OLS regression of the bond yield on the dollar exchange is clear from Fig. 4. First, *BY* can shift due to a change in the risk-free rate. A regression of bond yields on the dollar exchange rate could, in this case, identify the *FX* curve and indicate that a depreciation against the dollar (a rise in the dollar exchange rate) is associated with lower bond yields on dollar debt.

To avoid the simultaneity issue, we use panel data which allows us to control for changes in the risk-free rate, which affects all bond yields. In addition, we use the shift in the *FX* curve driven by British policy change in September 1931 and which affected the pound-dollar exchange rate. This helps identify the magnitude of the elasticity of the dollar-bond yield with respect to the dollar exchange rate. According to the model, this is an elasticity based on market sentiment about the likelihood of default after the exchange rate changes which affect the local currency value of dollar-debt. To deal with differences in levels of bond yields, and other time-invariant unobservables at the bond/country level, we use panel data and control for bond-country fixed effects which also subsume country fixed effects.

As highlighted by Lorenzoni (2014), multiple equilibria for the bond price/yield may exist. The "bad" equilibrium with a higher yield can arise if investors become more pessimistic about the probability of repayment. In our framework, this corresponds to a shift upwards in the *BY* curve, which, unlike a change in the risk free rate, could affect only certain countries. If this change in sentiment occurs for devaluing countries simultaneously with a devaluation, then the slope of *BY* cannot be cleanly identified from the shift in *FX*. In this case, we estimate the joint impact of changes in market sentiment on bond yields and exchange rate policy reaction to market sentiment. In the long-run, such a shift in *BY* could lead to an equilibrium with a higher yield and a return towards the initial exchange rate if the *FX* curve also shifted out. In sum, this possibility could bias our estimates of the impact of devaluation on bond yields downwards or towards zero. Since the bad equilibrium corresponds to a downward "spread spiral," this bias should be limited in the short run, which also validates our use of a short-horizon event study methodology.

[8] For example using mean values from our data of $\beta = .05, \beta_{£} = 0.48, \gamma = 1.4, \alpha = 0.03, \alpha_{£} = 0.3, \pi = 0.05$, and $e_{£\$} = 0.28, \bar{r} = .03$, this condition easily holds.

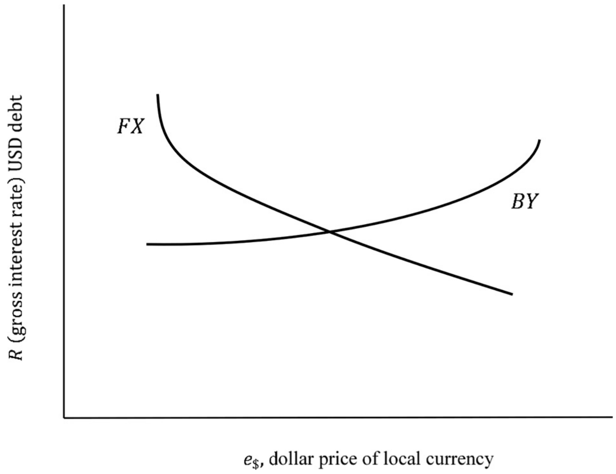

Fig. 4. Bond Yield/Exchange Rate Model.
Notes: Fig. shows the graphical representation of the gross interest rate and the US dollar exchange rate. See text for details.

7. Empirical model: bond yields, gold debt, and the exchange rate

In this section, we explore exchange rate movement as a determinant of sovereign default risk on hard currency debt. To do so, we leverage a before and after, difference-in-differences research design where the "treatment" group is the set of countries that maintain a gold standard after the sterling devaluation of September 21, 1931.[9] Since the US dollar maintained the link to gold in the weeks and years following this devaluation, staying on gold was equivalent to a dollar peg.

Using this shock to the sterling-dollar exchange rate and the associated exchange rate responses in third countries is motivated by the theoretical exercise above. With this policy shock, we can test the assumption that, on average, the slope of the *BY* curve is positive. We use expression (5) to guide a "first-stage" equation for the change in the US dollar exchange rate in response to sterling's exogenous and surprise devaluation against gold as a function of pre-determined variables such as trade and debt shares with the dollar and sterling bloc.

With this in mind, and based on the solution to our model in Fig. 4, we estimate the following regression model for gold clause bond yield data

$$\ln\left(\text{Yield}_{bst}\right) = \kappa + \beta_1(\text{ gold standard}_{st} \times \text{post}_t) + \mu_b + \delta_t + \xi_{bst} \tag{9}$$

where b denotes a bond, s indexes a country, t indexes a time period (day or week), "gold standard" is an indicator equal to one if a country has not devalued the exchange rate from the gold parity, post_t is an indicator equal to one in the weeks following the British devaluation of sterling which occurred on 21 September 1931, μ_b is a set of bond fixed effects, δ_t is a set of period fixed effects and ξ_{bst} is a possibly heteroscedastic, and autocorrelated, mean zero, finite variance error term.

In regressions using eq. (9), we compare gold standard countries to countries that either pegged to sterling and devalued against the dollar or those which did not devalue against gold as much as sterling (i.e., the managed floaters).

Given our empirical framework, we expect β_1 to be negative if markets priced debt higher when a country's exchange rate held steady against gold. This effect is separately identified from any "market" effects which are controlled for in the period fixed effects δ_t. We allow for time invariant country-bond (or country) specific factors affecting the level of the yield with bond fixed effects. Any time-varying changes at the country-bond level are assumed to be collected in the error term ξ_{bst}.

We interpret β_1 as the relative impact on gold-clause bond yields for countries pegging to gold in the wake of the British devaluation. This is an effect measured *relative* to countries that did not maintain their gold parity after the British devaluation. Our research design and methods take us in the direction of alleviating concerns about simultaneity, selection, and endogeneity that might bias the estimate of β_1 away from a causal effect.

To address selection and endogeneity, we face three main issues. The first is the timing of country-level devaluations. To tackle this issue, we use the British devaluation of sterling which was publicly announced on Monday September 21st, 1931 as an exogenous driver of exchange rate responses. By the end of the week, sterling was devalued by roughly 23% against gold currencies, with the bulk of the change coming early in the week. Prior to this devaluation of a key international currency, only countries in severe economic stress had devalued. Sterling's devaluation prompted countries to choose an exchange rate strategy since a major anchor country had now devalued.

[9] Bordo et al. (2009) followed a similar approach in the 1870s when France demonetized silver. They found that countries that stayed on a silver standard had higher bond yields on gold clause debt relative to gold standard countries.

The exact timing and magnitude of sterling's overnight devaluation against gold was largely unanticipated by markets despite the fact that the British economy and financial system had been under strain throughout 1931. Accominotti (2009) notes that even as early as October 1929 there was "world-wide concern." The Macmillan report, published in 1930, also featured opinions from several influential economists that devaluation of sterling would eventually be required. Keynes was not amongst them, proposing instead tariffs, export bounties, and other policies to increase domestic demand. Many, including Bank of England's governor, Montagu Norman, believed that sterling's international position would be damaged due to a devaluation. Experts recognized that external liabilities like allied war debts, payable in US gold dollars, would increase in value with devaluation (Cairncross and Eichengreen, 1983).

Nevertheless the decision to devalue was taken on Friday September 19 by the Bank of England's deputy governor in response to an acceleration of gold reserve losses during the week and a failure to secure more international credit (Einzig, 1932). Formal approval was given by parliament and announced on 21 September. Montagu Norman, en route to England from Canada on a steamship, was sent the coded radio message over the weekend "Old Lady Goes off on Monday." He allegedly mis-understood this message to be in reference to his mother's vacation and upon arrival in the UK on 23 September was in shock to hear the news (Boyle, 1967).

The second concern is selection which drives the share of gold-clause vs. sterling debt. As argued above, the "original sin" literature points out that nearly all countries issue abroad in foreign currencies. In our data the main issue is whether countries with a larger share of dollar-gold bonds in their foreign debt differ systematically from other countries. New York was the paramount financial center in the 1920s and all debt in New York was by custom issued with a gold clause. Debt in London was payable in either sterling or dollars. Many countries had debt listed in both markets which allows us to separate out country from local-market effects.

Fig. 5 shows the foreign currency debt-to-exports ratio in 1928 for a sample of the countries with usable data in United Nations (1948). Most foreign currency debt in 1928 was payable in US dollars or British sterling. The range of foreign debt-to-export ratios was 0 (USA and Turkey) to above 3.3 for Portugal and Panama. The median was 0.91, and the mean was 1.16. The interquartile range was 1.07 with a 25th percentile of 0.45 and a 75th percentile of 1.52.

Table 2 presents a simple balancing test for our debt-share variable. We run a simple regression of the share of gold/US dollar debt in foreign debt for a small set of countries for which we have complete data in 1932. Only a country's inflation

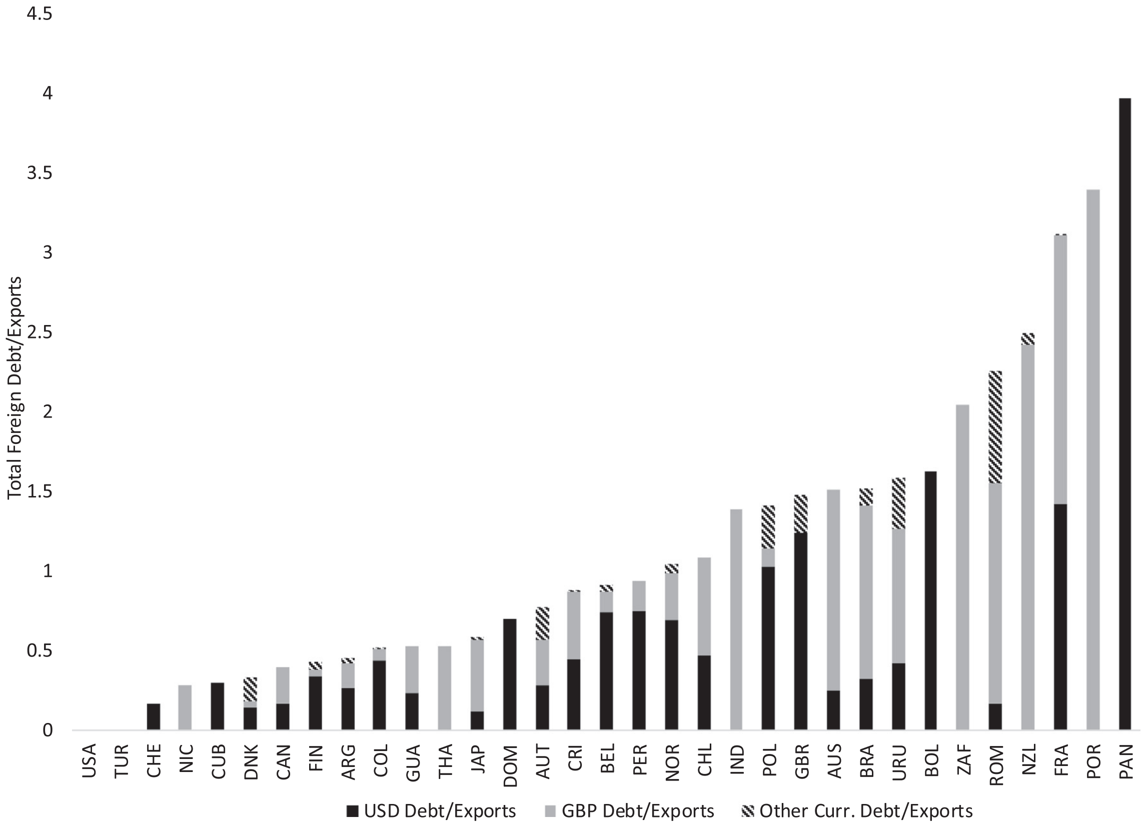

Fig. 5. Average Ratio of Foreign Public Debt to Exports for 33 Countries, 1928.
Notes: Data are from United Nations (1948). See text for a description of data.

Table 2
Determinants of Various Debt Ratios, Cross Sections, 1928.

	Share of Foreign Debt in USD	Domestic Debt/Total Debt	Debt in £/Exports
	(1)	(2)	(3)
Cumulative inflation 1920–28	−0.00**	0.00	0.01**
	[0.00]	[0.00]	[0.00]
Ln (population)	−0.03	0.15*	0.04
	[0.07]	[0.07]	[0.19]
Debt/population	−259.12	−203.49	2279.64***
	[204.66]	[168.98]	[641.29]
M2/GDP	0.00	0.01	0.00
	[0.00]	[0.00]	[0.01]
British Empire (0/1)	−0.20	0.33**	−0.53
	[0.13]	[0.12]	[0.40]
Observations	11	11	11
R-squared	0.61	0.62	0.79

Notes: Dependent variable in the regression at the top of each column.. Estimation is by Poisson PPML. Robust standard errors are in brackets. *** p-value <0.01; ** p-value <0.05; * p-value <0.10.

history in the 1920s is significant and the point estimate is small in magnitude. Population and British Empire are significant determinants of the overall size of foreign debt while the debt to population ratio is a significant determinant of the ratio of sterling debt to exports. In general, selection does not seem to be a major concern consistent with the literature on “original sin”.

A third concern is the endogeneity of the exchange rate choice after sterling's devaluation. After estimating OLS regressions, we estimate a two-stage least squares regression motivated by our structural model. Conceptually, we aim to estimate the size of the shift term which is theoretically driven by pre-determined or exogenous factors as per expression (5). In particular, we predict the gold standard indicator with four pre-determined variables (interacted with a post-period dummy indicator) suggested by the structural model and eq. (5): the ratio of gold-dollar debt to exports; the ratio of sterling debt to exports; the ratio of trade with the USA relative to GDP; and the ratio of trade with the UK to GDP. Our first stage linear probability model is

$$1\cdot(GS_{bst}) = \sum_j \left(\frac{T_{sj}}{Y_{st}}\right)\omega_o^j \times post_t + \sum_j \left(\frac{Debt(j)_s}{Exports_s}\right)\omega_1^j \times post_t + \delta_t + \mu_b + \epsilon_{bst} \tag{10}$$

where $1\cdot(GS_{st})$ is an indicator for whether the country s issuing bond b adheres to the gold standard or not in period t and $j = USA, UK$. Countries can choose their exchange rate freely in each period, potentially leading to a lack of independence in the error terms across countries over time. We cluster standard errors at the country level throughout to deal with such potential correlations.

7.1. Data

We hand-collect and compile a new, high-frequency macro-financial dataset to test our model and prediction. We collect data on sovereign bond prices, coupon yields, foreign currency denomination, exchange rates and a range of control variables. Our data appendix contains more detail regarding our data.

We first rely on weekly bond price data (relative to par or the coupon rate) from the set of all colonial and sovereign bond issues listed in every Saturday issue of *The Economist* between 1 August 1931 and 17 October 1931. Bond prices refer to closing prices on the Wednesday before publication (i.e., Wednesday 29 July for the August 1 issue). The London sample comprises 46 long-term bonds for 26 countries and 9 British dependencies. We also add a small sample of 15 more bonds for 7 economies from the New York market available from the *New York Times*. We used the highest closing price in the *New York Times* for each bond and the listed coupon rate.

The “pre-event window” in the weekly sample covers the eight weeks prior to the sterling devaluation of 21 September 1931. The post-period includes the six weeks following sterling's devaluation.

The Economist also lists exchange rates and coupon interest rates. We calculate current yields (coupon yield divided by bond price) for each bond listed. In addition we compile and classify bonds according to their foreign currency clauses for each London-listed bond from the *Stock Exchange Official Intelligence* (1931). See our discussion in the appendix on bond classification. All New York debt was payable in gold dollars at the official parity of $20.67/oz. of gold.

We also collect a set of daily bond price data covering 28 days. We include each day for which the *Financial Times* reported data between September 7, 1931 and October 8, 1931. The pre-event window includes the 13 days of data up to Saturday 9/19/1931. The post-event window encompasses 16 days beginning with Tuesday 9/22/1931. The sample encompasses

45 economies and 160 bonds from the New York and London markets. We omit bonds that are in default according to the *Stock Exchange Official Intelligence* (1931).

Foreign currency public debt data for the interwar period was compiled by the United Nations (1948).[10] These data list the outstanding principal of public debt payable or denominated in various currencies (largely sterling and dollars). More information is given in the data appendix.

To classify pegs, within the weekly estimating sample, we use a range of a +/− 3% cumulative change since the event date in the nominal exchange rate against the US dollar gold parity or the pre-event sterling exchange rate to determine if a country has a sterling or gold peg.

We use countries that pegged to gold as a "treatment" group. We also use those that pegged to gold and separately to sterling as two distinct treatment groups in a second set of results. As mentioned above, there were four categories of countries: those which pegged to sterling, those which pegged to gold, those which devalued relative to gold but not by as much as sterling and those which underwent further devaluation and depreciation or appreciation beyond sterling's decline in value. The latter category of appreciators comprises only one observation in our baseline sample.

7.2. Empirical results: weekly data

Gold peg countries had significantly lower bond yields on gold clause/US dollar debt relative to non-gold countries after sterling's devaluation. Fig. 6 shows the average, unconditional bond yield by week for countries that always remained on the gold standard versus the average yield for countries that never pegged to the gold standard bloc in the post-event period. The countries with pegs to the gold bloc in the weekly window are: Belgium, France, Japan, and Poland. We have 154 bond-weeks for countries that continuously maintained the gold standard between 9/21/1931 and the end of our weekly sample. There are 165 bond-weeks for economies that were not always pegged to the gold standard bloc in the sample weeks following sterling devaluation. The economies here include: Argentina, Australia, Canada, Denmark, Norway, and Uruguay.[11]

Table 3 shows OLS and two-stage least squares results for regressions based on our eq. Eq. (9). In the first two columns, the treatment group is the set of countries with a peg to the gold bloc (period-by-period) and the control group is all other countries not pegging to gold.[12] This set of regressions shows that gold peg countries experienced yields that were 11 to 12 log points lower than the non-gold standard group.[13]

The first stage regression shows that higher gold debt (relative to exports) raises the likelihood of maintaining the gold standard and that sterling debt (relative to exports) reduces the likelihood. Greater trade with the US (relative to GDP) drives down the likelihood of adherence to the gold standard. The trade ratio with the UK is not significant. The F-statistic for the first stage is reported at 120.

The next set of results allows two reference/treatment groups: gold standard countries and those that pegged to sterling. These two groups are compared to a control group of countries that "floated" between these two extremes in the post-period. Sterling peggers see higher yields relative to a set of comparison non-gold/non-sterling economies. Many of these comparison economies had not devalued against gold as much as sterling. The data suggest sterling peggers depreciated by an average of 8% more against the dollar. Gold standard countries see lower yields although the two-stage least squares coefficient is somewhat smaller in absolute magnitude than at −0.07 (p-value = 0.035) than when we compare gold to all non-gold economies. The first stage results are very similar to those from the first two columns. The F-statistic here is much lower at 25.

Fig. 7 presents results from using *local projections* (Jordà, 2005). Here the dependent variable is the log bond yield in $t+h$ (h = 0, …,6) minus the log of the bond yield in $t+h-1$. Period 0 is the week prior to September 21. We instrument the gold shock (= 1 in the immediate post-period, −1 if a country goes off a gold peg in the post-period, and 0 otherwise) with the same instruments as in Table 3. We also include period fixed effects. The local projections show that gold standard countries had bond yields on the order of 12 to 15 log points lower relative to the non-gold group in the post-period.

We find strong evidence that depreciation raises bond yields relative to economies that pegged to gold in the short-run. This is consistent with the idea that depreciation and valuation effects could increase the net outflow of capital weakening the balance of payments. Such pressure would undoubtedly be met with expectations of greater difficulty in the future of maintaining either debt repayment or exchange rate commitments.

[10] We thank Barry Eichengreen and his co-authors Livia Chiţu, and Arnaud Mehl for making the digitized version of these data available to us. We say more about these data below.

[11] The countries from Fig. 6 in the daily data that adhere or peg to gold standard countries throughout the post-event period are: Austria, Belgium, Bulgaria, Switzerland, Chile, Colombia, Cuba, Czechoslovakia, Spain, Finland, France, Greece, Haiti, Hungary, Ireland, Japan, Peru, Poland, Romania, Serbia, and USA. The countries that never peg to the gold bloc in the post-period include Argentina, Australia, Canada, UK, and Uruguay. There are more bond-weeks in these samples than in the regression sample due to missing currency denomination data etc. Results are similar within the regression sample.

[12] The countries on gold (or pegged to gold) for at least one post-period in the baseline weekly regression sample are: Belgium, Brazil, France, and Japan. The group that have at least one week not pegged to the gold bloc is Argentina, Australia, Brazil, Canada, Denmark, Norway and Uruguay.

[13] We also used the log of the bond price, the yield in levels, the percentage spread with the British consol as a reference yield, and the level of the spread as alternative dependent variables. All results are qualitatively consistent with those reported here. We also included the output gap in 1931 relative to 1928 as a first stage predictor of exchange rate choice. Results show gold standard countries have yields 14 log points lower than non-gold countries (p-value = 0.00) when including this control. The F-statistic from the first stage improves to 228.

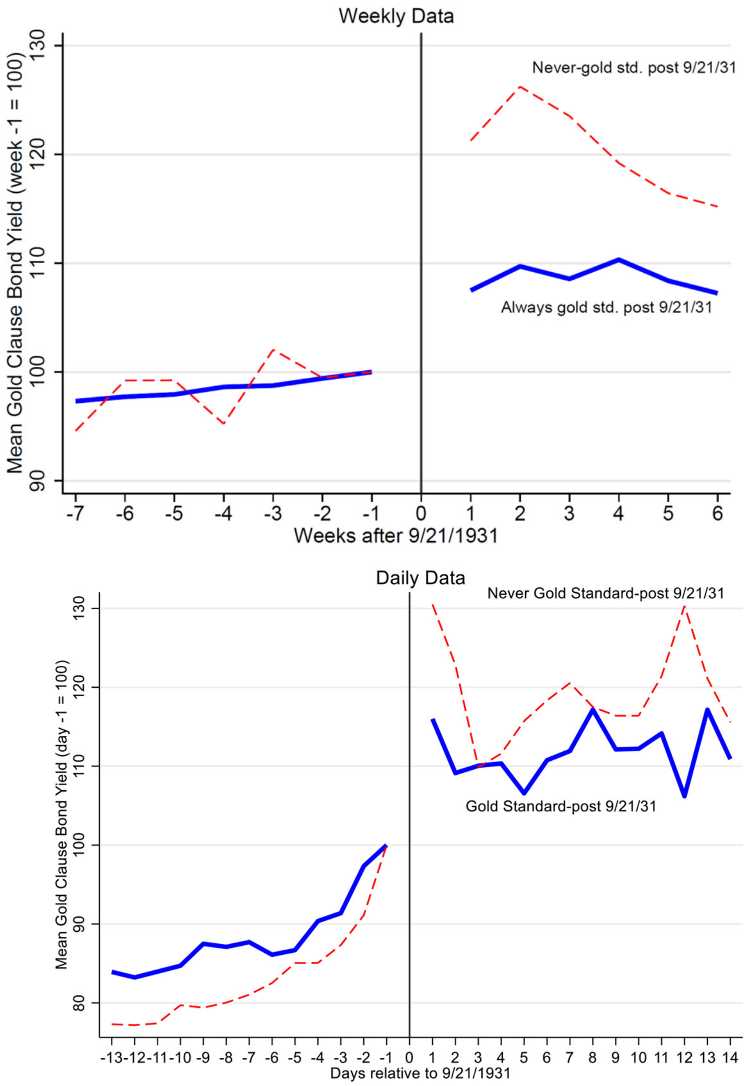

Fig. 6. Raw Gold Clause Bond Yields for Always Gold and Never Gold Standard/Gold Peg Countries prior to and following Sterling's Devaluation.
Notes: Fig. 6 shows the indexes of the average of gold clause bond yields for weekly and daily data. Data are indexed to the week/day prior to the week/day of sterling's devaluation. Countries are classified as to whether they maintained a gold standard in all periods following sterling's devaluation (solid line) or never maintained the gold standard (dashed line) post-sterling devaluation.

7.2.1. Empirical results: daily data

We also explore these relationships using daily data. Our specification remains largely the same as that for the results in Table 3. The baseline comparison group includes sterling peggers and countries that devalued against gold by less than sterling but depreciated against gold by >2%. There are no countries that devalue against gold more than sterling did in this sample. We classify sterling peggers as those that devalued after 9/21/1931 and were within +/− 3 log points of the pre-event log sterling exchange rate in the post-event window. The sample includes very few sterling pegs with gold debt (3 Australian bonds and 2 British bonds all listed in New York).

Table 4 shows results for our daily regressions. Countries that stayed on the gold standard and with gold-debt, experienced a 20–25 log point decline in bond yields relative to the broad comparison group. Countries devaluing against gold and pegging to sterling saw no differential change in yields compared to the intermediate countries. Our first stage results are strong and in line with those in Table 3 which showed that trade and debt were strong determinants of exchange rate movements.

Fig. 7 shows results from local projections using the same instruments for the gold standard "shock" variable. Gold standard countries experienced a relative reduction in yields of up to 40 log points in the first 10 days after 9/21, but by the end of the second week, the relative decline is estimated to be roughly 12 log points—this in line with results from our weekly data.

Table 3
Gold Clause Bond Yields and the Sterling Devaluation, Weekly data.

	Gold vs. Non-gold standard countries			Gold, Sterling vs. others			
	OLS	2SLS	First Stage Gold Peg	OLS	2SLS	First Stage Gold Peg	First Stage GBP Peg
Gold peg × post	−0.11**	−0.09***		−0.10**	−0.07**		
	[0.04]	[0.03]		[0.03]	[0.03]		
Sterling peg × post	–	–		0.06	0.11		
				[0.05]	[0.08]		
New York market × post	0.08*	0.08**		0.08**	0.08**		
	[0.04]	[0.03]		[0.03]	[0.03]		
(GOLD Debt/GDP) × post			2.51*			2.51*	−1.59*
			[1.35]			[1.35]	[0.89]
(GBP Debt/GDP) × post			−0.14			−0.14	0.67**
			[0.35]			[0.35]	[0.28]
UK Trade/GDP			−3.21**			−3.21**	−0.21
			[1.59]			[1.59]	[1.07]
US Trade/GDP			−1.88			−1.88	−2.69*
			[1.75]			[1.75]	[1.46]
Observations	319	319		319	319		
R^2	0.60	0.59		0.61	0.57		
Number of Bonds	23	23		23	23		
Number of Countries	10	10		10	10		
Cragg-Donald F-Statistic			120				25
SW-F-Stat excluded IVs			15			11.7	5.4

Notes: Regressions are by OLS. The dependent variable is the log of the current yield of a number of bonds. We include fixed effects for each bond and week fixed effects. The sample is each Wednesday between 7/29/1931 and 10/28/1931. All bonds in the sample payable in gold at a fixed exchange rate or in US gold dollars at $20.67 per ounce of gold. Robust, standard errors clustered at the country level are in brackets. The first stage regressions predict exchange rate regime choice (interacted with the post-event indicator) and include the New York x post-period indicator as well as bond fixed effects and week fixed effects. *** *p*-value <0.01; ** p-value <0.05; * p-value <0.10.

We also estimate a fully flexible, two-way fixed effects "event study". This model allows for separate coefficients on the gold standard term for each period before and after sterling devaluation. The treatment group in this model is the group of countries which were always on gold after sterling's devaluation in the post-event window and we compare them to all countries/bonds that were not "always" pegged to gold in the post-event period. To deal with anticipation effects which seem to influence our results and show a slight rise prior to the actual event date, we eliminated the seven market days prior to 9/21/1931. We also eliminate 9/21/1931 from the sample. The comparison period is therefore 9/12/1931 labelled as day "−7".

After sterling's devaluation, gold countries see an immediate decline in their bond yields relative to the control group countries and relative to the pre-period reference point of about 27 log points (p-value = 0.013). This reduction is maintained throughout the two post-event weeks, and it averages about 24 log points. The post-period coefficients are jointly significant (F-statistic = 168.32). Fig. 8 shows coefficients and 95% confidence intervals for each period. In addition, there is no evidence of differential pre-trends for countries that would eventually maintain gold standard pegs during the event window. The pre-event coefficients are mainly precisely estimated zeros although days −13 and −12 are estimated at 0.02 (p-value = 0.05) and 0.03 (p-value = 0.035). The standard errors are much larger in the post-event window reflecting market chaos in the post-event period. The jump in the standard deviation of the dependent variable for the control group countries is roughly 35% (0.47 to 0.63). Our bottom line is that evidence is consistent with the idea that markets perceived gold-denominated debt to be a larger burden for countries that devalued against gold.

8. Discussion: exchange rate policy and foreign currency debt in the great depression

According to recent quantitative assessments of exchange rate policy in the 1930s, a large number of factors influenced policy makers' decisions on exchange rates. Pioneering research by Simmons (1994) highlighted political economy and balance of payments issues. In an exhaustive analysis, Nikolaus Wolf (2008) studied the hazard rate of quitting the gold standard. He considered the net international investment position, monetary policy credibility, trade network and alliance effects, and the political constraints that affected how balance of payments adjustment might be effected. In addition, the severity of the depression measured by the extent of deflation and presence of financial crises also were considered. Eichengreen and Irwin (2010) also showed that trade policy and exchange rate policy acted as substitutes, so that tariffs acted to insulate a gold standard country from global shocks. While previous studies like Wandschneider (2008), Wolf and Yousef (2007), and Wolf (2008) have emphasized a multitude of factors driving exchange rate regime choice, one issue that has not been examined quantitatively in a comparative fashion is the currency denomination of debt.

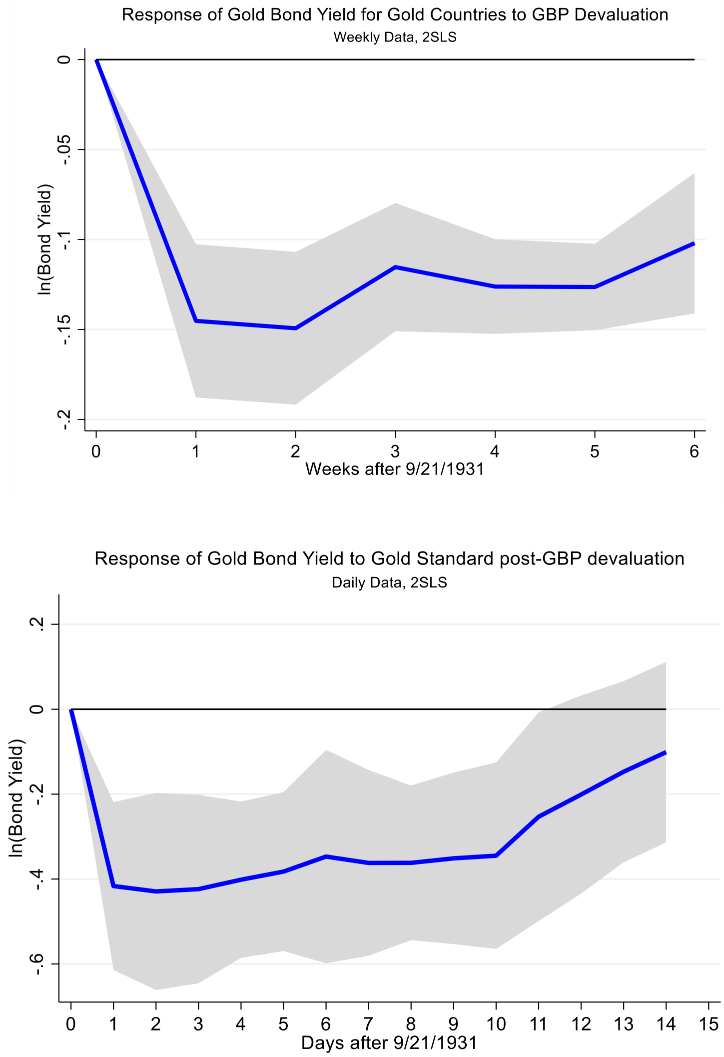

Fig. 7. Local Projections for Gold Clause Bond Yields, Weekly Data.
Notes: Fig. 7 shows the impulse response of the logarithm of the current gold clause bond yield to being on the gold standard in the weeks/days following September, 21, 1931. The method of estimation is local projections. The dependent variable is the difference between the log yield at horizon $t + h$ and the log yield at $t + h - 1$. All regressions include week fixed effects. Standard errors are clustered in each regression at the country level. 95% confidence bands are shown in gray.

Effective exchange rate volatility was limited for most countries between 1926 and 1929. Between 1929 and 1935 exchange rate movements were often extreme. These fluctuations had a significant impact on the value of foreign debt expressed in the local currency. In 1929 our dataset shows that Denmark had 43% of its foreign debt denominated in US dollars, 10% in pounds, and the remainder mostly in Swedish kronor. Fig. 9 for Denmark between 1928 and 1934 shows the rise in foreign and total debt expressed at current exchange rates relative to debt values at official exchange rate parities in percentage terms. We also plot the percentage deviation of the kronor price of US dollars relative to initial parity of 1928. Nominal exchange rate depreciation relative to gold parity of over 70% by 1932/33 was associated with a 55% increase in the kronor value of foreign public debt and a 30% rise in the value of total public debt. Fig. 10 and Fig. 11 show similar results for Norway and Chile. For Chile, which experienced massive depreciation, foreign debt measured in local currency was 3 times higher by 1935 than it had been in 1930. Clearly, exchange rate fluctuations, even for relatively advanced countries like Denmark and Norway, had the capacity to significantly complicate public finances.

In the British Empire, exchange rate movements were monitored and frequently discussed. Australia, a commodity exporter, had already devalued relative to gold parity (and sterling) from October 1930 by 8.5%. By January 1931, the Australian pound had depreciated by 30% against sterling relative to 1928 and relative to its historical one-to-one parity. Australia's balance

Table 4
Gold Clause Bond Yields and the Sterling Devaluation, Daily data.

	Gold vs. Non-gold standard countries			Gold, Sterling vs. others			
	OLS	2SLS	First Stage	OLS	2SLS	First Stage Gold Peg	First Stage GBP Peg
Gold peg × post	−0.20***	−0.22***		−0.20**	−0.23**		
	[0.05]	[0.06]		[0.08]	[0.09]		
Sterling peg × post				−0.01	−0.01		
				[0.10]	[0.14]		
New York market × post	0.24***	0.24***	−0.02	0.24**	0.24***	−0.02	0.08
	[0.07]	[0.07]	[0.08]	[0.08]	[0.08]	[0.08]	[0.05]
(GOLD Debt/GDP) × post			2.92***			2.92***	−2.03**
			[0.97]			[0.97]	[0.89]
(GBP Debt/GDP) × post			−0.50*			−0.50*	0.69*
			[0.28]			[0.28]	[0.35]
US Trade/GDP			−0.89			−0.89	−5.95*
			[2.05]			[2.05]	[3.12]
UK Trade/GDP			−1.74			−1.74	−0.11
			[1.95]			[1.95]	[1.29]
Observations	874	874		874	874		
R^2	0.56	0.56		0.56	0.56		
Number of Bonds	32	32		32	32		
Number of Countries	10	10		10	10		
Cragg-Donald F-Statistic			136				123
SW F-Stat excluded IVs			13.8			18.6	7.3

Notes: Regressions are by OLS. The dependent variable is the log of the current yield of a number of bonds. We include fixed effects for each bond and day fixed effects. The sample is each day between September 7, 1931 and October 8, 1931. We omit 9/21/1931. All bonds in the sample are payable in gold at a fixed exchange rate or in US gold dollars at \$20.67 per ounce of gold. Robust, standard errors clustered at the country level are in brackets. The first stage regressions include the New York and post-period indicator as well as bond fixed effects and day fixed effects. *** p-value <0.01; ** p-value <0.05; * p-value <0.10.

sheet in 1928 was composed of sterling liabilities to the tune of £5 per person and exports totaling £25 per person (Commonwealth Bureau of Census and Statistics, 1934 p. 885). Imperial banks held a quantity of sterling reserves to manage their currency exposure and balance sheets. Policy makers noted that "export prices…had declined by the end of 1931 to about 32 percent of the 1927-28 level…while at the same time interest obligations remained fixed in sterling…import prices fell very much less than export prices….(and) total cessation of oversea long-term loans" (Commonwealth Bureau of Census and Statistics, 1934 p. 885). It was noted that sterling's depreciation in September 1931 led to a "corresponding reduction in the real burden of interest payments by Australian governments" (Ibid. p. 887). However Australia reacted almost immediately by devaluing further relative to the old gold parity and by the same amount as Britain. This acted to keep the Australian pound pegged to sterling but with a roughly 30% discount relative to the old gold parity. Intense austerity and a default on domestic bondholders featured in Australia's subsequent policy response. Consequently there was ultimately no default on foreign debt. The Premier of New South Wales' motion in early 1931 to suspend overseas interest payments until such time that interest on debt could be renegotiated down was rejected by the Premiers' conference.

In New Zealand, matters were much the same, although policy was slightly more cautious than in Australia in terms of devaluation. From January 1931 the New Zealand pound had been devalued by about 10% against sterling. This discount was maintained until 1934. Like in Australia, it was noted that the fall in export prices (expressed in home currency) after 1927/28 led to a rise in the burden of payment of interest of 60% as of 1931/32 (New Zealand, 1932). New Zealand mulled over a number of policy responses including exchange control and further devaluation, but little action was taken prior to January 1933 when the country opted for a 25% devaluation against sterling (Drummond, 1981).

In a response to a contemporary government-sponsored report on public finances, A.D. Park replied that "New Zealand is linked with Great Britain by strong ties of sentiment, trade and debt, and it would be inadvisable to make any permanent change in the basis of New Zealand currency without full discussion of the matter with the British authorities." He also suggested that "…intentional depreciation of the currency would undoubtedly have a much greater (negative) effect on our credit" (New Zealand, 1932 p. 39).

Drummond (1981) also highlights the implications of sterling debt for currency policy in other major economies of the British Empire such as Canada, India, and South Africa. In Canada, following sterling's devaluation, the question, again, was whether to un-tether the Canadian dollar from the gold parity. T.B. Macaulay, a business leader recommended an immediate depreciation of 20–25% against gold (and the US dollar). However, Prime Minister Bennett, was intensely worried about the cost of repaying foreign debt in terms of local currency (Drummond, 1981). In September 1931, the Prime Minister wrote, "I feel sure that those who recommend this country to go off [the] gold standard do so without recognition of the obligations payable by this country in New York, to say nothing of the obligations of private industries and corporations" (Drummond, 1981 pp. 60–61). Bordo and Redish (1990) analyzed the Canadian debt position in the early 1930s finding small "flow" losses from valuation effects and depreciation. Their paper concluded that Canada maintained exchange rate stability due to concerns about credibility.

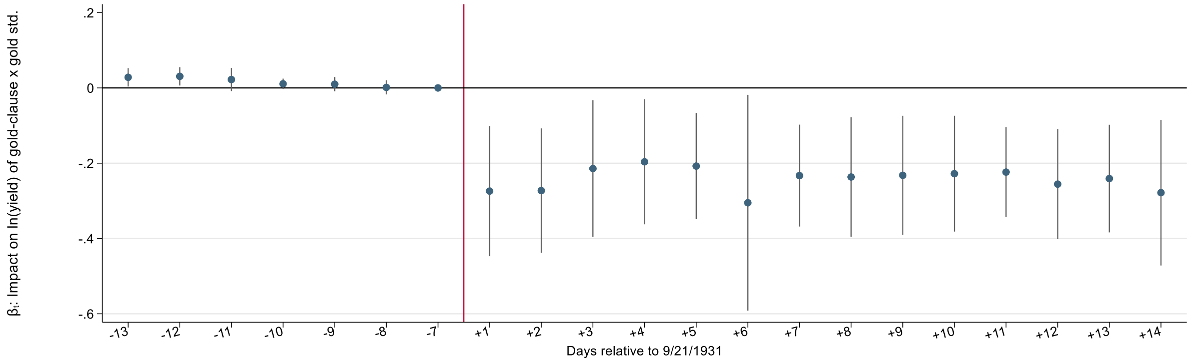

Fig. 8. Bond Spreads, Gold Clauses and Exchange Rate Policies, Daily Data, Event Study.
Notes: Fig. shows the coefficients on the always gold standard indicator each day before sterling's devaluation and after devaluation on 9/21/1931. The day 9/21/1931, the "event" date, and the six days prior to the event date are omitted from the sample. We use 9/14/1931 (day −7) as the reference period with coefficient constrained to zero. The dependent variable is the log of the bond yield, and the included controls are those in Table 4 (day fixed effects, bond fixed effects, and a New York market x post-event indicator). Standard errors are clustered at the country level. 95% confidence bars are shown. The sample is the same as that in Table 4.

Bordo and Redish (1990) did not analyze the importance of trade flows and stability in the balance of payments which is an alternative hypothesis.

In India, beset by falling export revenue, major political uncertainty and the ever-present "home charges" (i.e., recurrent payments to the UK denominated in sterling such as interest on debt and civil servant pensions), exchange rate policy was paramount. India carried a sterling debt of roughly £350 million (roughly £1.66 per person), had sterling outlays of £30 million per year and possessed about £42 million of reserves. Markets feared a depreciation and default "…but the India Office would not hear of a fall in the rupee" (Drummond, 1981, p. 34). As melodramatic as that might sound, India ultimately held the line by pegging to sterling at the pre-September 1931 rate of 1 shilling 6 pence. Exchange controls helped prevent a disastrous outflow of speculative capital and loss of reserves.

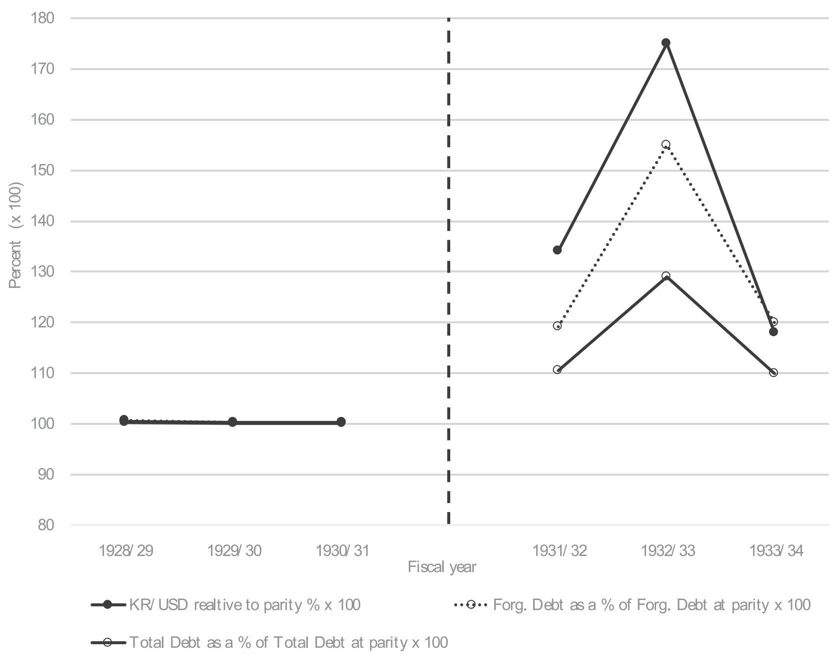

Fig. 9. The Impact of Exchange Rate Depreciation on Foreign Debt for Denmark, 1928–1934.
Notes: Fig. shows the impact of the depreciation of the kronor on the value of Danish debt in kronor. Data are from United Nations (1948). KR/USD is the exchange rate of the Danish crown versus the US dollar. Foreign Debt and total debt at current exchange rates and at a fixed exchange rate was calculated by the United Nations (1948).

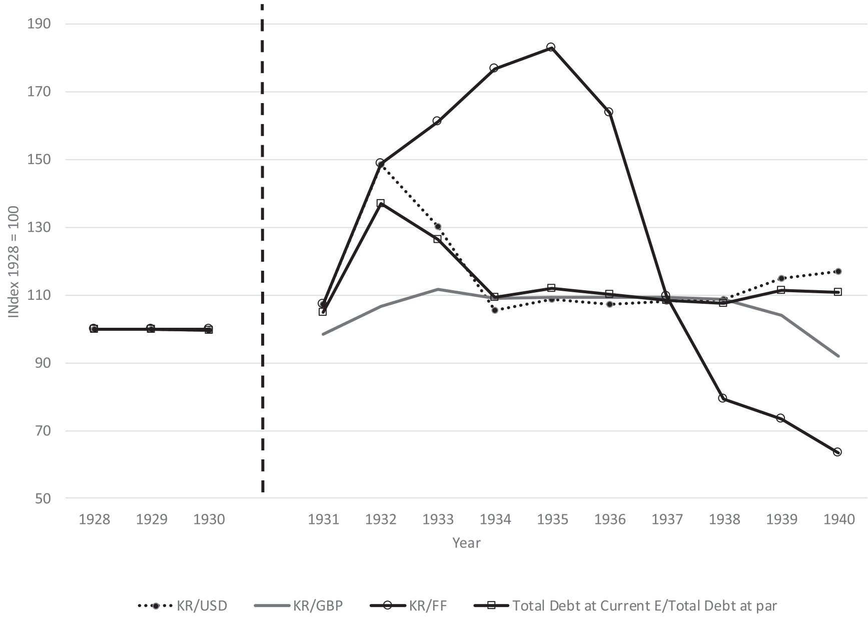

Fig. 10. The Impact of Exchange Rate Depreciation on Foreign Currency Debt for Norway, 1928–1940.
Notes: Fig. shows the impact of the depreciation of the kronor on the value of Norwegian debt measured in kronor. Data are from United Nations (1948). KR/USD is the exchange rate of the Norwegian crown (kronor) versus the US dollar. Foreign debt in foreign currency and at par exchange rates in kronor is given in the United Nations (1948). We use only the debt issued in GBP, US dollars and French francs. We use cross exchange rates to convert foreign currency to kronor at current exchange rates.

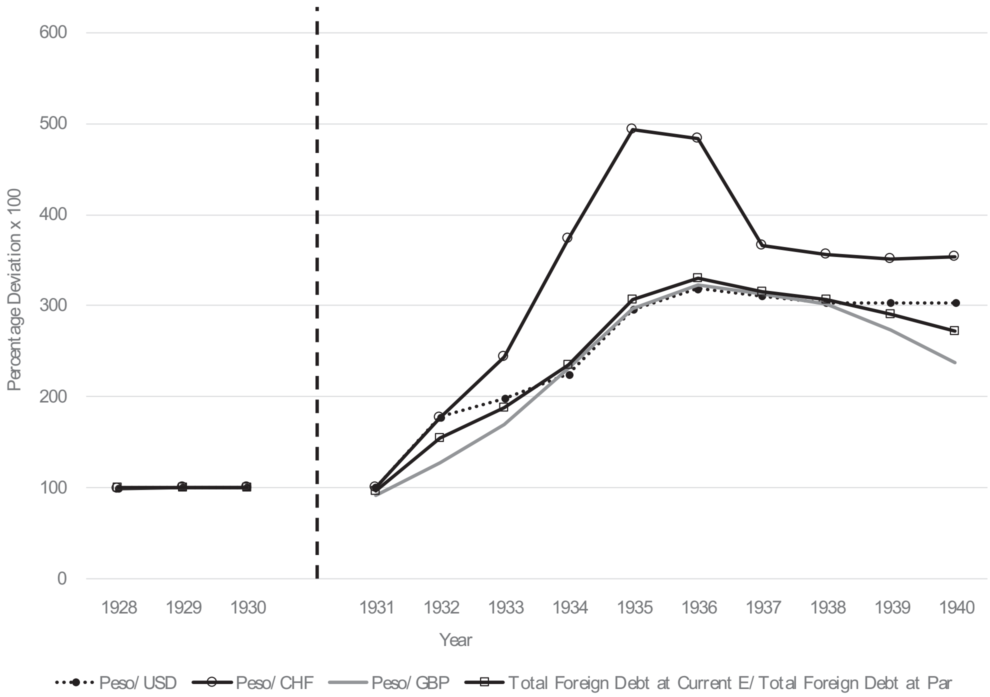

Fig. 11. The Impact of Exchange Rate Depreciation on Foreign Currency Debt for Chile, 1928–1940.
Notes: Fig. shows the impact of the depreciation of the peso on the value of Chilean debt measured in pesos. Data are from United Nations (1948). Peso/USD is the exchange rate of the Norwegian crown (kronor) versus the US dollar. CHF is the Swiss franc, and GBP is pounds sterling. Foreign debt in foreign currency is given in the United Nations (1948). Debt was issued in US dollars, pounds sterling and in Swiss francs. We use cross exchange rates to convert foreign currency to kronor at current exchange rates and at par. Par exchange rates are given in United Nations and are equal to those prevailing in 1928.

In other countries, similar dynamics applied. With the onset of the Great Depression, the real burden of public debt increased for many reasons: exchange rate movements, falling incomes and price levels, lower exports and plummeting commodity prices. Debt default was not un-common in the period amongst many South American nations. In addition, Germany and others suspended, and then postponed, reparations payments after the Hoover Moratorium of 1931 and the Lausanne Conference later in 1932. Allies also suspended repayments of official wartime obligations. While the economic crisis generally took a toll on capacity to re-pay, exchange rate movements were frequently a key concern for those countries trying to manage their debt, and capital markets priced debt accordingly. Unreported calculations show the year in which countries defaulted on sovereign repayments, if any, and the year they exited the gold standard. Countries that defaulted before they left the gold standard waited an average of 2.6 years before going off the gold standard. Countries that went off gold first waited an extra 1.5 years to default. Other countries defaulted and un-pegged at the same time. A majority (32 of the 60 countries studied here) never defaulted in this period. The bottom line is that foreign currency debt surely contributed to and interacted with exchange rate policy in the early years of the Great Depression.

9. Conclusion

With the outbreak of the Great Depression, nearly every country in the world was forced to decide whether to maintain an orthodox monetary regime or to attempt to restore domestic demand by devaluing against gold. These choices were conditioned in part by debt and trade patterns. Markets also priced default risk into foreign currency or gold denominated debt when countries devalued.

Policy makers in the 1930s were well aware of the fact that depreciation could have a very negative impact on the ability to service external debt and on market perceptions of ability to re-pay. Officials in Australia noted the budgetary benefits of lower interest payments in terms of domestic currency when sterling was devalued in September 1931 (Commonwealth Bureau of Census and Statistics, 1939). They also argued in August 1931, prior to sterling's devaluation, that a hypothetical devaluation of the Australian pound against sterling would, oppositely, aggravate the government deficit.

In September 1931, the UK Treasury gifted Commonwealth nations like Australia with a devaluation of sterling. This offered the best of both worlds. Such countries could maintain their peg allowing for stability of the balance of payments. At the same time, the devaluation relative to gold worked to improve internal balance. Other countries were not so fortunate and stayed locked into gold much longer. Why?

Two important channels that connected nations' monetary choices were trade and debt. Historical ties shaped trade and investment connections. The choice to devalue in the 1930s also depended on monetary policy in the key creditor nation. The currency composition and amount of debt mattered for the choice to devalue, but was also dependent on the actions of other nations. Sterling's devaluation of 1931 focussed policy makers' attention on the costs and benefits of which country to choose as an anchor and what policy to follow. Whether a country could follow sterling off gold or had to wait for the dollar to break its gold peg was in significant part related to historical and geographic fundamentals driving debt denomination and trade patterns.

Clearly the resolve to combat deflation and unemployment mattered, but these were not the only considerations for policy makers in the early 1930s. We have shown evidence consistent with the idea that the currency denomination of debt also mattered for policy in the 1930s. In explaining why the Great Depression lasted so long compared to other economic downturns, surely economic interdependence through the global economy must be considered. This does not imply, of course, that a policy of autarky would have been better. Instead it signals the crucial significance of international cooperation and coordination in a globalized economy.

Data availability

https://data.mendeley.com/datasets/d845w6tkv8/1 (Original data) (Mendeley Data)

Declaration of Competing Interest

Neither Michael D. Bordo nor Christopher M. Meissner has a competing interest or conflict of interest related to the article we are submitting titled “Original Sin and the Great Depression”.

Appendix A. Data Appendix A.1

United Nations Currency Denomination of Public Debt Data

We rely on debt data compiled by the United Nations (1948) which listed the amount of public foreign debt denominated in each currency converted to local currency at “par” exchange rates. These were converted to US dollars at constant exchange rates by Chiţu et al. (2014). We rely on the data set assembled by Chiţu et al. (2014) which involve some additions to the United Nations data. These data, and how they were assembled and processed, are thoroughly discussed by Chiţu et al. (2014).

A number of caveats must be issued. Cross-country comparability in data reporting and recording is always a worry. The United Nations statisticians attempted to make data as comparable as possible. Data issued in a foreign currency is allocated to the foreign debt column because it is presumably purchased by foreigners. If domestic residents purchased foreign currency debt, the UN or local authorities may not have recorded this debt as foreign debt. The opposite holds for domestic currency debt. The amounts involved would appear to be small. In Norway in 1940, domestic holding of foreign currency debt and foreign holding of domestic currency debt involved roughly 3% of total outstanding debt (United Nations, 1948 p. 107).

United Nations (1948) collected data for up to 35 countries and colonies. The sample of countries for which we have data on both GBP and USD debt grows from 23 in 1925 to 31 in the 1930s. We dis-regard debt denominated in currencies besides the pound and dollar. The total amount of debt outstanding issued in other currencies averaged 7.9% of total foreign currency debt as listed in the United Nations (1948) between 1925 and 1938. The total sample of countries used in our regressions is between 11 and 15 depending on specification because of missing control variables.[14]

United Nations (1948) included only limited information on the currency denomination of debt service (interest and redemptions) on foreign debt for selected countries. It does provide total (foreign) debt service for most countries. While the model suggests using debt service by currency, we are forced to use the stock of debt by currency denomination instead due to these data constraints.

Dollar exchange rates are listed in the United Nations source, although we also cross-checked these data and filled in missing values with those provided by David S. Jacks (private communication) and those used in Bordo et al. (2001). Daily exchange rate data come from Global Financial Database. Data on bilateral trade shares come from data underlying Jacks et al. (2011).

Reserve data are from Bordo et al. (2001) and where missing from the League of Nations (various years) as well as Bank for International Settlements (1932).

Default dates are from Reinhart and Rogoff (2011). We account for default on war reparations as well as default or nonpayment of inter-allied debt. Default on these debts began in 1931 with the Hoover Moratorium. Since these standstills had repercussions for the balances of payments we record them as defaults. We also use information in the *Financial Times* and *The Economist* to tell us when particular bonds are in default.

Bonds for Event Study, weekly sample

The table below lists the bonds included in the event study of weekly bond yields. We have included all listed Dominion, Colonial and Foreign bond yields from the weekly issues of *The Economist* published between August and October 1931. *The Economist* was published on Saturdays and listed bond prices for the previous Wednesday. No information on high-low prices nor for bid-ask spreads is given.

For yields we calculated the current yield (coupon/price) for all bonds. However, we used the "present yield" given by *The Economist* for the two French bonds (4%s and 5%s) and for Canada's 4%s. Chile, Turkey, Mexico, and Brazil were in default according to *The Economist*. We do not use data on bond prices from these latter countries. To calculate bond spreads, we used the current yield on the British consol.

To determine the currency of denomination or repayment we used the *Stock Exchange Official Intelligence* for 1931. This source listed the contractual terms for a large number of bond issues for these governments. We were able to locate all of the bonds listed in *The Economist* in this source. When a bond was contractually payable at an exchange rate favorable to the debtor in a currency including, but not limited to, the pound we labelled this as payable in GBP. Otherwise bonds were payable in other currencies linked to gold.

The Stock Exchange Official Intelligence (1931) reveals that nearly all bonds issued in London were payable in sterling when payable in London. *The Economist* (26 September 1931 p. 571) noted that Germany's Dawes loans and the Young Plan debt as well were "issued in this country on a sterling basis". For the British colonies and the greater Commonwealth, all issues in London were payable in sterling. After sterling's devaluation in September 1931, it was a matter of debate whether Australian and New Zealand debt was meant to be paid in British sterling or local pounds.[15] Ultimately it was determined that London-issued debt was payable in British sterling.

For several leading countries, public debt was made payable in British sterling when issued in London. However, *The Economist* (26 September 1931, p. 571) noted that, "…A number of sterling overseas loans have been made on a gold basis, the principal and interest being payable in other currencies at a fixed rate of exchange, based on the gold parity of sterling."

Other bonds were often issued in multiple currencies and cross-listed in multiple markets. Investors had a choice of currency in which to be paid. We assume that bondholders demanded repayment in the strongest currency. For example, the Danish 3% sterling bond was payable in French francs as written on the face of the (bearer) bond. Since France maintained the gold standard in the early 1930s, we assume investors would claim payment in Paris and so we classify this bond as having a gold clause. Another type of bond includes those cross-listed in New York and London. Any such bond had the option to be paid in New York in US gold dollars ($20.67/oz.) at the choice of the bond-holder. We classify these as gold bonds as well since the US maintained the gold standard in the event window.

The *Stock Exchange Official Intelligence* (1931) reveals that some bonds carried a clause that allowed coupons and principal to be paid at "sight" (i.e., spot) exchange rates (against London) in various continental markets (e.g., Paris, Berlin, Amsterdam, Hamburg, Geneva) or the home market. For instance, the Egyptian 4% bond was payable at the spot exchange rate in Paris and Berlin.

14 The countries included are: Argentina, Australia, Belgium, Brazil, Canada, Denmark, Finland, Japan, New Zealand, Norway, Portugal, Switzerland, Uruguay.

15 Drummond (p. 1031981) notes: "In all three countries (Australia, New Zealand and South Africa) ordinary people and even financiers were inclined to believe that a pound is a pound regardless of provenance." The surrounding discussion relates to the actual price of British sterling in terms of local sterling which diverged from parity. We discuss this further below.

We classify this bond as payable in pounds sterling since the pound depreciation did not imply higher franc or mark payments. Debtors on these bonds had the option of simply converting sterling to Francs at the spot exchange rate.

The complete list of bonds in our weekly dataset and their classification is given in the following tables.

London Sample weekly data from *The Economist*					
Country	Bond Description	Currency	Country	Bond Description	Currency
AUS	AUS 5% 1945–75	GBP	DNK	Danish 3%	GOLD
CAN	Canada 4% 1940–60	GBP	DZG	Danizg 6.5%	GBP
LKA	Ceylon 6% 1936–51	GBP	EGY	Egypt Unified 4%	GBP
GHA	Gold Coast 4.5% 1956	GBP	EST	Estonia 7% 1927	GBP
KEN	Kenya 5% 1948–58	GBP	FIN	Finland 6% 1923	GOLD
NGA	Nigeria 5% 1950–60	GBP	FRA	France 4% (British)	GOLD
AUS	NSW 5% 1935–1955	GBP	FRA	France 5%	GOLD
NZL	NZ 5% 1946	GBP	DEU	Germany 7%	GBP
AUS	Queensland 5% 1940–1960	GBP	DEU	Germany 5.5% Stg. Bonds 1930	GBP
ZAF	South Africa 5% 1945–1975	GBP	GRC	Greece 6% Stabilization Loan	GBP
SGP	Straits Settlement 4.5% 1935–1945	GBP	GRC	Greece 7% Refugee	GOLD
ARG	Argentina 4% Reciss.	GOLD	HUN	Hungary 7.5%	GBP
AUT	Austria 6% 1923–1943	GBP	JPN	Japan 5.5% 1935–1965	GOLD
AUT	Austria 7% Int. Red. By 1957	GBP	JAP	Japan 6% 1924	GOLD
ARG	Buenos Aires Prov. 3.5%	GOLD	MEX	Mexico 5% 1899	GOLD
BEL	Belgium 7%	GOLD	NOR	Norway 4% 1911	GOLD
BGR	Bulgaria 7.5% Loan	GBP	PER	Peru 7.5% 1922	GBP
BRA	Brazil 5% Fund, 1914	GBP	POL	Poland 7%	GOLD
BRA	Brazil 6.5% 1927	GOLD	THA	Siam 6% 1934–64	GBP
CHL	Chili 6% 1929	GBP	SWE	Sweden 3.5% 1908	GOLD
CHN	China 5% 1912	GBP	BRA	Sao Paulo Coffee 7.5%	GOLD
CHN	China 5% 1913	GOLD	TUR	Turkey 4% Unified	GBP
CZE	Czechoslovakia 8%	GBP	URY	Uruguay 5% 1919	GOLD

The New York sample of bonds in our weekly dataset is listed below. All bond prices were from the prices published on Wednesday between 7/29/1931 and 10/28/1931. A range of bond prices was given in the newspaper according to different order volumes. We took the highest bond price available. All debt was payable in 1931 in US dollars and since the dollar was still linked to the gold standard we coded this a payable in “gold”.

New York Sample (*New York Times*)		
Country	Bond description	Currency
AUS	AUS 4.5% 1956	GOLD
AUS	AUS 5% 1955	GOLD
BEL	BEL 6% 1955	GOLD
BEL	BEL 6.5% 1949	GOLD
CAN	CAN 4.5% 1936	GOLD
CAN	CAN 4% 1960	GOLD
CAN	CAN 5% 1952	GOLD
CHN	CHN 5% 1951	GOLD
DNK	DNK 4.5% 1962	GOLD
DNK	DNK 5.5% 1953	GOLD
DNK	DNK 6% 1942	GOLD
FRA	FRA 7% 1949	GOLD
FRA	FRA 7.5% 1941	GOLD
JAP	JAP 5.5% 1965	GOLD
JPN	JAP 6.5% 1954	GOLD
SWE	SWE 5.5% 1954	GOLD

Data Appendix A.2

Bonds and Data for Event Study, daily sample

This table shows all bonds available in the *Financial Times*. We used the *Stock Exchange Official Intelligence* (1931) to determine the currency clause for each bond. Daily exchange rates are from Global Financial Data. All bonds from New York (listed in bold) are payable in gold. All Mexican, Honduran, and Turkish bonds are listed as in default in the *Stock Exchange Official Intelligence* (1931) and excluded from the estimating sample.

Country	Bond Description	Currency	Country	Bond Description	Currency
ARG	ARGENTINE 4% RESCISSION	GBP	RUS	RUSSIAN 5% 1906	GBP
ARG	ARGENTINE (PORT OF CAPITAL) 5%	GBP	FRA	SEINE 7% STER. BDS.	GBP
ASA	S. AUSTL. 5% 1945–75	GBP	SLV	SALVADOR 6% BONDS	GBP
AUS	S. AUSTL. 6% 1930–40	GBP	BRA	SN. PAULO 6%	GBP
AUS	AUS 4.75% 1940–1960	GBP	BRA	SN. PAULO COFFEE 7%	GOLD
AUS	AUS 5% 1935–1945	GBP	BRA	SN. PAULO COFF 7.5% BDS	GOLD
AUS	AUS 5% 1945–75	GBP	STR	STRAITS 4.5% 1935–45	GBP
AUT	AUSTRIAN 6%	GBP	AUS	TASMANIA 5% 1932–42	GBP
AUT	AUSTRIAN 7%	GBP	THA	SIAM 6%	GBP
BEL	BELGIAN 3% 1914	GBP	TUR	TURKISH 4% UNIFIED	GBP
BEL	BELGIAN 7%	GOLD	GBR	GB Consols 2.5%	GBP
BGR	BULGARIA 7%	GBP	URY	URUGUAY 3.5%	GBP
BRA	BRAZILIAN 4% RESCISSION	GBP	URY	URUGUAY 5% 1896	GBP
BRA	BRAZILIAN 4% 1910	GBP	ZAF	UN. OF S.A. 5% 1933–43	GBP
BRA	BRAZILIAN 4% 1911 LOAN	GBP	ZAF	UN. OF S.A. 5% 1945–75	GBP
BRA	BRAZILIAN 4% 1889	GBP	AUS	VICTORIA 4.75% 1940–60	GBP
BRA	BRAZILIAN 5% 1903	GBP	AUS	VICTORIA 5% 1945–75	GBP
BRA	BRAZILIAN 5% 1913	GBP	AUS	VICTORIA 5.5% 1930–40	GBP
BRA	BRAZILIAN 5% FUNDG1914	GBP	AUS	W. AUSTL. 4.5% 1935–65	GBP
BRA	BRAZILIAN 5% 1895	GBP	AUS	W. AUSTL. 5% 1945–75	GBP
BRA	BRAZILIAN 5% FUNDING	GBP	ZWE	STHERN RHODESIA 5%	GBP
BRA	BRAZILIAN 6.5%	GOLD	**ARG**	**ARGEN. 6% 1959**	**GOLD**
CAN	CAN 3.5% 1930–50	GBP	**AUS**	**AUSTL 4.5% 1956**	**GOLD**
CAN	CAN 4% 1940–1960	GBP	**AUS**	**AUSTL. 5% 1955**	**GOLD**
ZAF	CAPE 3.5% 1929–1949	GBP	**AUS**	**AUSTL. 5% 1957**	**GOLD**
CHL	CHILEAN 4.5% 1886	GBP	**AUS**	**BRISBANE 5% 1957**	**GOLD**
CHL	CHILEAN 5% ANN. A	GBP	**AUT**	**AUSTRIA 7% 1943**	**GOLD**
CHL	CHILEAN 6% 1928	GBP	**FRA**	**BORDE'X 6% 1934**	**GOLD**
CHL	CHILEAN 7.5%	GBP	**BEL**	**BELGIAN 6% 1955**	**GOLD**
CHN	CHINESE 4.5% GOLD 1896	GBP	**BEL**	**BELGIAN 7% 1955**	**GOLD**
CHN	CHINESE 5% 1912	GBP	**BGR**	**BULG. 7% 1967**	**GOLD**
CHN	CHINESE 5% pelt'rg.G.I. '13	GOLD	**BRA**	**BRAZIL 6.5% 1957**	**GOLD**
CHN	CHINESE 5% 1896	GBP	**BRA**	**BRAZIL 7.5% 1952**	**GOLD**
COL	COLOMBIAN 6% 1913	GBP	**CAN**	**CANADA 5% 1952**	**GOLD**
CRI	COSTA RICA 5% 1911	GOLD	**CHE**	**SWISS 5.5% 1945**	**GOLD**
CZE	CZECHOSLOVAKIA 8%	GBP	**CHL**	**CHILE 6% 1961**	**GOLD**
IDN	DUTCH EAST INDIES 5%	GBP	**CHL**	**CHILE 7% 1942**	**GOLD**
IDN	DUTCH EAST INDIES 6%	GBP	**COL**	**COLOMBIAN 6% 1961**	**GOLD**
DEU	GERMAN 5.5%	GBP	**CZE**	**CZECHOSLOVAKIA 8% 1951**	**GOLD**
DEU	GERMAN 7%	GBP	**CUB**	**CUBA 5.5% 1953**	**GOLD**
DEU	POTASH SYND. OF GERM. 7%	GOLD	**IDN**	**DUTCH EAST INDIES 5.5% 1953**	**GOLD**
DEU	WESTPHALIA 7%	GBP	**IDN**	**DUTCH EAST INDIES 6% 1962**	**GOLD**
DZG	DANZIG 7%	GBP	**DEU**	**GERMAN 5.5% INT. 1965**	**GOLD**
EGY	EGYPTIAN UNIFIED 4%	GBP	**DEU**	**GERMAN 7% 1949**	**GOLD**
ESP	SPANISH 4%	GOLD	**DEU**	**HEIDLBERG 7.5% 1950**	**GOLD**
FIN	FINLAND 6%	GBP	**DNK**	**DENMARK 5.5% 1955**	**GOLD**
FRA	FRENCH WAR LOAN 4% (brit. Iss.)	GOLD	**FIN**	**FINLAND 6% 1945**	**GOLD**
FRA	FRENCH WAR LOAN 5%	GOLD	**FIN**	**FIN. MN. 6.5% 1954**	**GOLD**
GRC	GREEK 4% MONOPOLY	GBP	**FRA**	**FRENCH 7% 1949**	**GOLD**
GRC	GREEK 6% BONDS	GBP	**FRA**	**FRENCH 7.5% 1941**	**GOLD**
GRC	GREEK 7%	GBP	**GRC**	**GREEK 6% 1968**	**GOLD**
GTM	GUATEMALA 4%	GBP	**GRC**	**GREEK 7% 1964**	**GOLD**
HND	HONDURAS	GBP	**HTI**	**HAITI 6% 1952**	**GOLD**
HUN	HUNGARIAN 7.5%	GBP	**HUN**	**HUNGARY 7.5% 1944**	**GOLD**
HUN	HUNGARY (C'NTIES) 7.5%	GBP	**IRL**	**IRISH FREE STATE 5% 1960**	**GOLD**
IRL	IRISH FREE STATE 4.5% LAND BONDS	GBP	**ITA**	**ROME 6.5% 1952**	**GOLD**
ITA	ITALIAN RENTES 3.5%	GBP	**ITA**	**ITALIAN 7% 1951**	**GOLD**
JAM	JAM 4.5% 1941–1971	GBP	**JPN**	**TOKYO 5.5% 1961**	**GOLD**
JPN	JAPAN 4% 1910	GBP	**JPN**	**JAPAN 5.5% 1965**	**GOLD**

(continued)

Country	Bond Description	Currency	Country	Bond Description	Currency
JPN	JAPAN 4% 1899	GBP	**JPN**	**JAPAN 6.5% 1954**	**GOLD**
JPN	JAPAN 5% 1907	GBP	**NOR**	**NORWAY 5.5% 1965**	**GOLD**
JPN	JAPAN 5.5% CONV.	GOLD	**NOR**	**NORWAY 6% 1944**	**GOLD**
JPN	JAPAN (TOKYO) 5.5%	GBP	**NOR**	**NORWAY 6% 1952**	**GOLD**
JPN	JAPAN 6% 1924	GBP	**PER**	**PERU 6% 1961**	**GOLD**
LKA	CEYLON 6% 1936–51	GBP	**PER**	**PERU 7% 1959**	**GOLD**
MEX	MEXICAN 5% 1899	GOLD	**POL**	**POLAND 6% 1940**	**GOLD**
MEX	MEXICAN 6% TREAS. BDS.	GOLD	**POL**	**POLAND 7% 1947**	**GOLD**
NGA	NIGERIA 4% 1963	GBP	**POL**	**POLAND 8% 1950**	**GOLD**
AUS	N.S.W. 3% 1935	GBP	**DEU**	**PRUSSIA 6.5% 1951**	**GOLD**
AUS	N.S.W. 4.5% 1935–45	GBP	**AUS**	**QUEENSL. 7% 1941**	**GOLD**
AUS	N.S.W. 5% 1945–65	GBP	**RDS**	**R.DO SUL. 8% 1946**	**GOLD**
AUS	N.S.W. 5.25% 1935–45	GBP	**ROU**	**RUMANIAN 7% 1959**	**GOLD**
NZL	N.Z. 3.5% 1940	GBP	**FRA**	**SEINE 7% 1942**	**GOLD**
NZL	N.Z. 4.5% 1948–58	GBP	**BRA**	**S. PAULO 6% 1968**	**GOLD**
NZL	N.Z. 5% 1946	GBP	**BRA**	**S. PAULO 8% 1950**	**GOLD**
PER	PERUVIAN CORP. 5% DEBENTURES		**DEU**	**SAX. P. W. 6.5% 1951**	**GOLD**
PER	PERUVIAN CORP. 5% ORDINARY		**DEU**	**SAX.P.W. 7% 1945**	**GOLD**
PER	PERUVIAN CORP. 5% PF		**SRB**	**SERB. 7% 1962**	**GOLD**
PER	PERUVIAN GOVT 6%	GOLD	**SRB**	**SERB. 8% 1962**	**GOLD**
PER	PERUVIAN GOVT. 7.5% (GUANO)	GBP	**SWE**	**SWEDEN 5.5% 1954**	**GOLD**
POL	POLAND (1927) 7%	GOLD	**GB**	**U.K. 5.5% 1937**	**GOLD**
POR	PORTUGUESE 3% (1st srs)	GBP	**GB**	**U.K. FUND. 4%**	**GOLD**
POR	PORTUGUESE 3% (3RD SERIES)	GBP	**GB**	**U.K. 5% WARLN**	**GOLD**
AUS	QU'NSLAND 5% 1940–60	GBP	**URY**	**URUGUAY 6% 1960**	**GOLD**
ROU	RUMANIAN EX. 4% 1922	GBP	**USA**	**US. LIB. LOAN 3.5% 1932–1947**	**GOLD**
ROU	RUMANIAN 4% CONS	GBP	**USA**	**U.S. 3.75% T. BDS**	**GOLD**
ROU	RUMANIAN 7%	GOLD	**USA**	**U.S. LIB. LOAN 4TH 4.25% 1933–1938**	**GOLD**
ZAF	UN. OF S.A. 4% 1943–63	GBP	**USA**	**U.S. LIB. LOAN 4.5% 1932–1947**	**GOLD**

Appendix B. Robustness Checks

Table B1
Absolute Changes in Bilateral Exchange Rates against the US dollar and the British pound, 1930–1939, Extended Model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilateral Trade/GDP	−0.31**	−0.35**	−0.34**	−0.33**	−0.29**	−0.27*	−0.29***
	[0.14]	[0.16]	[0.15]	[0.13]	[0.15]	[0.15]	[0.11]
Bilateral Debt/GDP	0.01	−0.02	−0.02	−0.12**	−0.16***	−0.15**	−0.07
	[0.05]	[0.05]	[0.06]	[0.05]	[0.06]	[0.06]	[0.05]
Default	0.05***	0.04**	0.04**	−0.00	−0.02	−0.02	−0.02
	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]
Chg. ln (reserves)		−0.07***	−0.07***	−0.07***	−0.04*	−0.04*	−0.05**
		[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Chg. ln (Ex/Im)			−0.04	−0.02	−0.05	−0.05	−0.00
			[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
% Change in GDP per capita since 1928					−0.33***	−0.33***	
					[0.09]	[0.09]	
British Empire						−0.01	
						[0.02]	
ln (Nom. GDP/Nom. $\text{GDP}_{\text{UK/USA}}$)						0.00	
						[0.00]	
Observations	321	321	321	321	321	321	293
Number of Countries	12	12	12	12	12	12	12
Country Fixed Effects	NO	NO	NO	YES	YES	YES	YES

Notes: Dependent variable in the regression is the absolute change in the logarithm of the GBP exchange rate or the USD exchange rate. Changes are annual changes for a sample ranging over the years 1925 to 1938. All covariates are lagged by one year. Average marginal effects are reported. Estimation is by Poisson PPML. Robust standard errors, clustered at the pair and country level are in brackets. *** *p*-value <0.01; ** p-value <0.05; * p-value <0.10.

Table B2
Absolute Changes in Bilateral Exchange Rates against the US dollar and the British pound, 1930–1939, Panel Models using values of covariates in 1929.

	(1)	(2)	(3)	(4)
Bilateral Trade/GDP in 1929	−0.30***	−0.61***	−0.56***	−0.45**
	[0.08]	[0.13]	[0.17]	[0.20]
Bilateral Debt/GDP in 1929	−0.20***	−0.42***	−0.40***	−0.03
	[0.07]	[0.12]	[0.13]	[0.20]
Chg. ln (reserves) in 1929		−0.07**	−0.06	0.02
		[0.03]	[0.04]	[0.04]
Chg. ln (Ex/Im) in 1929			−0.02	0.10
			[0.03]	[0.06]
% Change in GDP per capita since 1928–29				−0.19***
				[0.07]
Observations	167	167	167	167
Number of Countries[a]	11	11	11	11
Year Fixed Effects	YES	YES	YES	YES

Notes: Dependent variable in the regression is the absolute change in the logarithm of the GBP exchange rate or the USD exchange rate. Changes are annual changes for a sample ranging over the years 1930 to 1938. All covariates are measured in 1929. Estimation is by Poisson PPML. Average marginal effects are reported. Robust standard errors, clustered at the pair and country level are in brackets. *** p-value <0.01; ** p-value <0.05; * p-value <0.10.
[a] The 11 countries are: Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Netherlands, Norway, Portugal, Switzerland. The 12 countries in Table B1 include these and Argentina which has reserves data for years after 1928 only

References

Accominotti, Olivier, 2009. The sterling trap: foreign reserves management at the Bank of France, 1928–1936. Eur. Rev. Econ. Hist. 13 (3), 349–376.
Aguiar, Mark, Gopinath, Gita, Gourinchas, Pierre-Olivier, Pazarbasioglu, Ceyla, Weeks-Brown, Rhoda, 2022. Why the IMF is Updating its View on Capital Flows. Downloaded on 4/1/22 https://blogs.imf.org/2022/03/30/why-the-imf-is-updating-its-view-on-capital-flows/.
Alfaro, Laura, Asis, Gonzalo, Chari, Anusha, Panizza, Ugo, 2019. Corporate debt, firm size and financial fragility in emerging markets. J. Int. Econ. 118, 1–19.
Bank for International Settlements, 1932. "The Gold Exchange Standard" Bank for International Settlements. Monetary and Economic Department C.B. 60.
Bénassy-Quéré, Agnès, 1996. Potentialities and Opportunities of the Euro as an International Currency CEPII Working paper no. 1996-09 July.
Bordo, Michael D., Redish, Angela, 1990. Credible commitment and exchange rate stability: Canada's interwar experience. Can. J. Econ. 23 (2), 357–380.
Bordo, Michael D., Eichengreen, Barry, Klingebiel, Daniela, Martinez-Peria, Maria Soledad, 2001. Is the crisis problem growing more severe? Econ. Policy 16 (32), 52–82.
Bordo, Michael D., Meissner, Christopher M., Redish, Angela, 2005. How 'original sin' was overcome: The evolution of external debt denominated in domestic currencies in the United States and the British dominions 1800-2000. In: Eichengreen, Barry, Hausmann, Ricardo (Eds.), Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies. University of Chicago Press, Chicago, pp. 122–153.
Bordo, Michael D., Meissner, Christopher M., Weidenmier, Marc, 2009. Identifying the effects of an exchange rate depreciation on country risk: evidence from a natural experiment. J. Int. Money Financ. 28 (6), 1022–1044.
Boyle, Andrew, 1967. Montagu Norman: A Biography. Cassell, London.
Cairncross, Alec, Eichengreen, Barry, 1983. Sterling in Decline: The Devaluations of 1931, 1949, and 1967. Routledge, New York.
Campa, Jose Manuel., 1990. Exchange Rates and Economic Recovery in the 1930s: An Extension to Lation America. . of Econ. Hist 50 (3), 677–682.
Céspedes, Luis F., Chang, Roberto, Velasco, Andres, 2003. IS-LM-BP in the pampas. IMF Staff. Pap. 50 (1), 143–156.
Chiţu, Livia, Eichengreen, Barry, Mehl, Arnaud, 2014. When did the dollar overtake sterling as the leading international currency? Evidence from the bond markets. J. Dev. Econ. 111, 225–245.
Commonwealth Bureau of Census and Statistics, 1939. Official Yearbook of the Commonwealth of Australia. L.F. Johnston Commonwealth Government Printer, Canberra.
Drummond, Ian M., 1981. The Floating Pound and the Sterling Area, 1931–1939. Cambridge University Press, New York.
Edwards, Sebastian, 2018. American Default: The Untold Story of FDR, the Supreme Court, and the Battle over Gold. Princeton University Press, Princeton.
Eichengreen, B., 1992. Golden Fetters: The Gold Standard and the Great Depression, 1919-1939. Oxford University Press, New York.
Eichengreen, Barry, Hausmann, Ricardo, 1999. Exchange rates and financial fragility. Proceedings - Economic Policy Symposium - Jackson Hole. Federal Reserve Bank of Kansas City, pp. 329–368.
Eichengreen, Barry, Hausmann, Ricardo, 2005. Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies. University of Chicago Press, Chicago.
Eichengreen, Barry, Irwin, Douglas A., 2010. The slide to protectionism in the great depression: who succumbed and why? J. Econ. Hist. 70 (4), 871–897.
Eichengreen, B., Sachs, J., 1985. Exchange rates and economic recovery in the 1930s. J. Econ. Hist. 45 (4), 925–946.
Einzig, Paul, 1932. The Tragedy of the Pound. Kegan Paul, Trench, Trubner & Co, London.
Flandreau, Marc, Sussman, Nathan, 2005. In: Eichengreen, Barry, Hausmann, Ricardo (Eds.), "Old Sins: Exchange Clauses and European Foreign Lending in the Nineteenth Century" in Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies. University of Chicago Press, Chicago, pp. 154–189.
Jacks, David S., Meissner, Christopher M., Novy, Dennis, 2011. Trade booms, trade busts, and trade costs. J. Int. Econ. 83 (2), 185–201.
Jordà, Òscar, 2005. Estimation and inference of impulse responses by local projections. Am. Econ. Rev. 95 (1), 161–182.
League of Nations (various years). Statistical year book of the League of Nations. League of Nations, Economic and Financial Section, Geneva, Switzerland.
Lorenzoni, G., 2014. International financial crises. In: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics. Elsevier, Amsterdam, pp. 689–740.
McCauley, Robert N., McGuire, Patrick, Sushko, Vladyslav, 2015. Global dollar credit: links to US monetary policy and leverage. Econ. Policy 30 (82), 187–229.
Reinhart, Carmen M., Rogoff, Kenneth S., 2011. From financial crash to debt crisis. Am. Econ. Rev. 101 (5), 1676–1706.
Simmons, Beth, 1994. Who Adjusts? Domestic Sources of Foreign Economic Policy during the Interwar Years. Princeton University Press, Princeton, N.J.
Stock Exchange Official Intelligence, 1931. London: Spottiswoode, Ballantyne.
The New York Times (various issues).
The Economist (various issues).
United Nations, 1948. Public Debt, 1914–1946. Department of Economic Affairs, Lake Success, New York, 1948: United Nations.
Verner, Emil, Gyöngyösi, Győző, 2020. Household debt revaluation and the real economy: evidence from a foreign currency debt crisis. Am. Econ. Rev. 110 (9), 2667–2702.
Wandschneider, Kirsten, 2008. The stability of the interwar gold exchange standard: did politics matter? J. Econ. Hist. 68 (1), 151–181.
Wolf, Nikolaus, 2008. Scylla and Charybdis: explaining Europe's exit from gold, January 1928–December 1936. Explor. Econ. Hist. 45 (4), 383–401.
Wolf, Holger C., Yousef, Tarik, 2007. Breaking the Fetters: Why Did Countries Exit the Interwar Gold Standard? The New Comparative History: *Essays in Honor of Jeffrey G. Williamson*. MIT Press, Cambridge, MA, pp. 241–265.
New Zealand, 1932. Report of the Economic Committee. W.A.G. Skinner, Govt. Printer, Wellington, NZ.