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How to Escape from the Debt Trap: Lessons from the Past

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How to Escape from the Debt Trap: Lessons from the Past

Abstract

Rising public debt everywhere has raised the question of how to reduce debt again in the future. High public debt also seems to be an impediment for the exit of central banks from ultra-low interest rates and quantitative easing. Historical precedents and proposals have included austerity, haircuts and the generation of inflation. Each way has advantages and disadvantages, including uncertainty about effects and side-effects. We approach the issue from an historical perspective, based on case studies of prominent approaches to debt reduction. We analyze debt reduction through economic austerity in Italy, hyperinflation in Germany after World War I, inflation in Argentina since the 1980s, currency reform in Germany after WW II, and financial repression in the United States and the United Kingdom after WW II. Finally, we discuss Ronald McKinnon's order of economic and financial liberalization as well as the Chicago Plan combined with the introduction of central bank digital currencies as an option for the future.

JEL-Codes: H120, H630, P260.

Keywords: low-interest trap, over-indebtedness, public debt, hyperinflation, monetary reform, economic reform, inflation, public debt relief.

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1. Introduction

In the corona crisis, gross national income in the industrialized countries declined strongly. The shock came at a time when global debt had already increased to high levels. By the end of 2020, the general government debt had risen to 127% of Gross Domestic Product (GDP) in the United States, 256% in Japan and 100% in the euro area. In 2021, large fiscal stimulus packages, aimed at reviving growth (Arnold and Khan 2019), are likely to further increase government debt. In addition, especially in the United States and China corporate debt has increased strongly since the turn of the millennium (Çelik et al. 2020).

The central banks of the large industrial countries, in particular the Federal Reserve, the European Central Bank, and the Bank of Japan, have responded with unprecedented monetary expansions. The US Federal Reserve System – in line with Ben Bernanke’s (2020) concept of a new monetary policy – moved towards extensive purchases of treasuries, corporate bonds, commercial paper, ETFs, municipal bonds, and asset-backed securities. In the euro area, the government bond purchases of the European Central Bank have kept the high debt levels of governments sustainable (Hannoun et al. 2019). In Japan, large government bond purchases of the central bank over decades have had the same effect (Yoshino et al. 2017).

High debt levels have trapped central banks into a policy of extremely low interest rates. Any material interest rate increases would threaten financial stability and public sector solvency. Thus, central banks have lost monetary dominance, which was re-established by US Federal Reserve Chairman Paul Volcker after the “stagflationary” 1970s through painfully high interest rates. Volcker could not have raised the Federal Funds Rate up to 22%, had private and public debt then not been at relatively low levels. After many years of facilitating government borrowing and protecting financial markets through ever lower interest rates, central banks have come under financial and fiscal dominance.

In the past, high levels of government debt were the origin of sovereign debt crises (Reinhart and Rogoff 2011). Therefore, a group of 110 ten economists recently proposed to devalue the government debt in the balance sheet of the Eurosystem – i.e. the European Central Bank and the euro area national central banks – to create new room for social and “green” expenditure

for protection of the environment (Dufrêne et al. 2021). The move has triggered a discussion about the sustainability of government debt and possible ways to reduce it. To provide an insight into different approaches to reduce government debt, we explore several historical experiments based, *inter alia*, on economic austerity, hidden debt reduction via financial repression, inflation, and outright default.

2. How Monetary Dominance Was Won and Lost Again

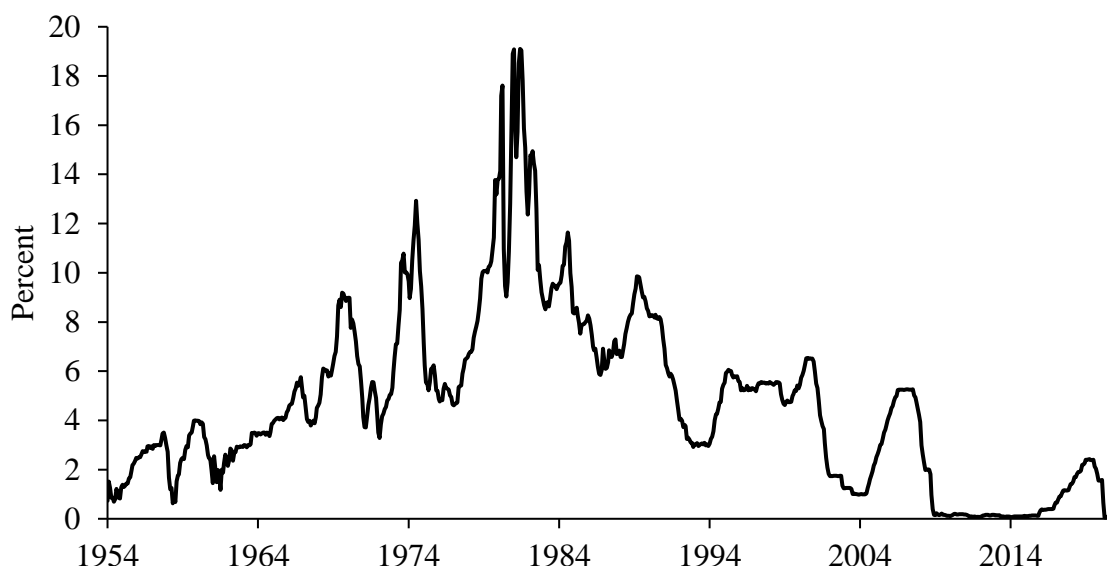
Paul Volcker became chairman of the Federal Reserve in 1979, after accommodating monetary policy had failed to boost growth and reduce employment during the 1970s. By the late 1970s the Federal Reserve experienced a loss of monetary control (McKinnon 1997, 325). A higher inflation rate than in other industrial countries, such as Japan and Germany, came along with persistent dollar depreciation. Owing to strong capital outflows, interest rates increased, which the Federal Reserve aimed to contain by Treasury Bond purchases. This further expanded the money supply, accelerated dollar sales, and pushed interest rates even higher. At the end of the 1970s, the United States were in danger of losing the ability to raise debt in US dollars in global markets.¹ In an attempt to boost confidence in the dollar, the United States issued government bonds in German marks and Swiss francs (so-called Carter Bonds, US Department of the Treasury 2010).

As strong post-WWII growth and financial repression had reduced government debt from more than 120% of GDP at the end of World War II to 34% in 1979 (Figure 7), the threat of a rising interest payment burden due to rising interest rates was relatively low. Hence, Paul Volcker could break the inflation dynamics by raising the effective Federal Funds Rate rates from 11.2% in 1979 to 22.4% on 22 July 1981 (Figure 1). This triggered a sharp recession and strong political protests, but also helped to stabilize the dollar and reduce inflation from 13.5% in 1980 to 1.9% in 1986 (Volcker 2018) (Figure 2). With this, Volcker in fact reestablished monetary dominance that had been lost by decoupling the US-Dollar from gold in 1971. His tool was the

¹ Under the Bretton Woods System, the countries at the periphery stabilized their exchange rates against the dollar. When the Fed expanded money supply, the dollar came under depreciation pressure and the central banks at the periphery had to purchase dollars to keep their exchange rates stable against the dollar. This constituted a quasi-unlimited line of credit and the “exorbitant privilege” (Giscard d’Estaing) to have government expenditure “co-financed” by other countries.

demonstration of central bank independence, an instrument, which became popular through the 1980s and 1990s on a global scale.

Figure 1: USA: Federal Funds Rate



Source: IMF.

Presumably, the government of Ronald Reagan could not have tolerated the reestablishment of monetary dominance by the Fed, if the monetary tightening had not been accompanied by extensive economic reforms (Reganomics). The focus was on deregulation (phasing out of price, interest, and wage controls), privatization, tax cuts, closures of tax loopholes and the reduction of government expenditures (Niskanen 1988).² The sharply increasing government deficit was financed by strong capital inflows (in particular from Japan), which were attracted by the interest rate increases. Growth rates increased strongly compared to the 1970s. Once inflation had come down, the interest rate could be reduced again (Figure 1).

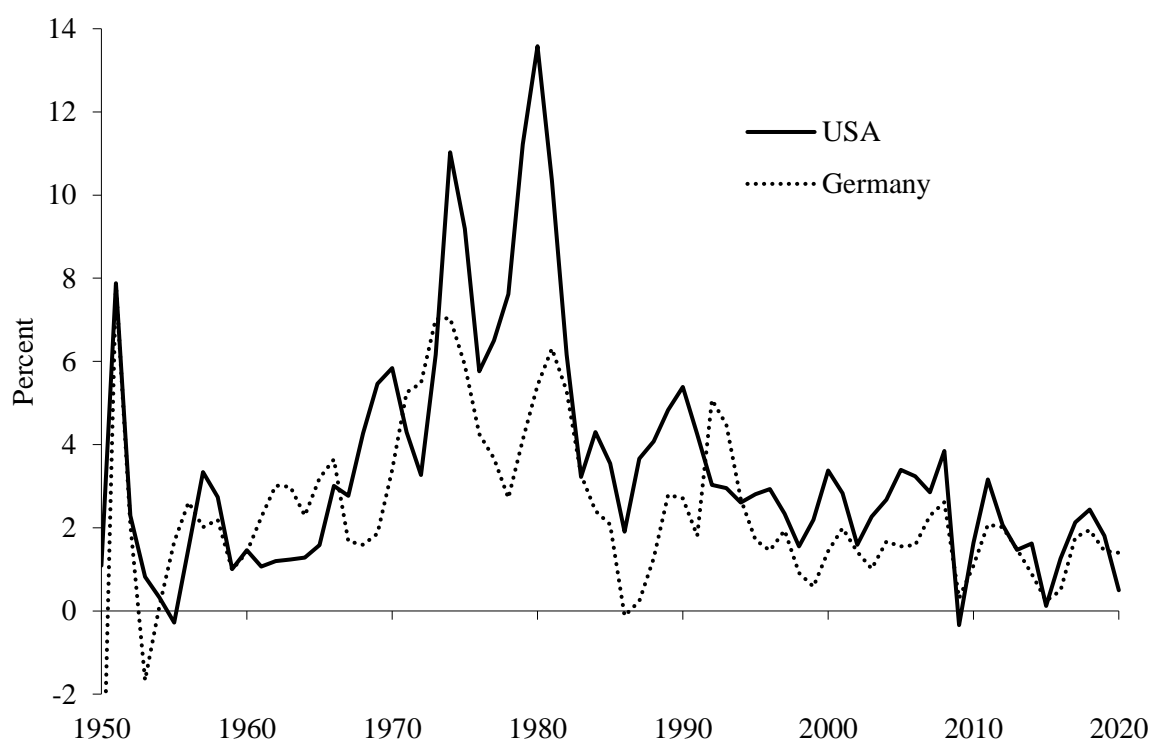
Alan Greenspan became chairman of the Fed in August 1987 and shortly thereafter initiated a move from monetary dominance of the Fed to the dominance of financial markets over the Fed. He responded to the 1987 stock market crash by strongly cutting interest rates. And again, in response to the burst of the dotcom bubble, the Fed sharply cut the Federal Funds Rate from

² Reagan's supply-side policies were similar to those of Margret Thatcher in the UK at about the same time.

6.5% in May 2000 to 1.0% in June 2003 (Figure 1). Having reached a – by then – historically low interest rate level, starting in June 2004 the Federal Reserve restored a more normal interest rate environment with so-called “baby steps” – gradual, small increases of interest rates – to 5.25% in June 2006 (Figure 1).

This tightening of monetary policy led to a reversal to monetary easing for two reasons. First, owing to a loose monetary policy since the turn millennium, a price bubble in the US real estate sector had emerged, driven by buoyant growth of credit and the issuance of asset-backed securities. When the Fed tightened monetary policy, the threshold for the profitability of real estate investments was lifted and the bubble burst. Falling real estate prices caused a large number of defaults, which ended in the US subprime and global financial crisis. Taylor (2013) argued that the Fed had kept the interest rate too low for too long.³

Figure 2: USA and Germany: Post World War II Consumer Price Inflation



Source: IMF.

³ The monetary overinvestment theory by Hayek (1931) explains why too low interest rates set by the central bank cause an unsustainable boom, which is inevitably followed by a bust.

Financial dominance was enshrined in the “Jackson Hole consensus”. It stipulated that central banks cannot lean against asset price bubbles as they cannot identify them but must respond decisively to any burst of a bubble as this may result in a financial crisis (Greenspan 2007, Bean et al. 2010, 5, Blinder and Reis 2020). This implied that the central bank implicitly signaled a bail-out in times of financial crises, and established an insurance that was dubbed “Greenspan put” by financial market participants (Greenspan 2002). Similar asymmetric monetary policies were adopted by other large central banks, such as the Bank of Japan and the European Central Bank, leading to a global decline of key interest rates on the back of repeated financial crises to and even slightly below zero (Hoffmann and Schnabl 2011).

Thus, the subprime crisis was followed by an even larger monetary expansion, which pushed up asset prices again, with further monetary expansion to be expected in the face of the next crisis. The Jackson Hole consensus created two types of moral hazards. First, banks and enterprises tended to take more risk during the upswing, as they could expect a bailout during a crisis. Second, most governments did not consolidate their debt during upswings, as they could again expect central bank support in the form of government bond purchases during a crisis. After the Great Financial Crisis of 2007/08, the Federal Reserve was slow in monetary tightening. Moreover, the Federal Funds Rate and the size of the central bank’s balance sheet did not return to their levels before the subprime crisis (Figure 1). The Bank of Japan and the European Central Bank refrained from any increases in interest rates and continued with asset purchases even during the economic recovery.

Market interest rate increases in the United States were dampened by strong foreign capital inflows and dollar appreciation as foreign purchases of US government bonds were stimulated by interest rate differentials. Furthermore, as low interest rates in the US had previously boosted borrowing in US Dollars abroad, the monetary tightening in the US put some emerging market economies under financial pressure (dubbed “taper tantrum”). Both factors imposed a strong constraint on interest rate increases in the United States.

When the corona-crisis broke out in March 2020, the monetary policy rescue measures – for banks, enterprises, and the government – reached new records. With monetary policy reaching the limit to its room for maneuver, central bankers called for fiscal policy to take over. They

contributed to the financing of government deficits by buying government bonds on a large scale. As the surge of government debt has created risks for government solvency when interest rates increase again, central bankers have in effect submitted themselves under fiscal dominance.

3. Austerity

The most straightforward approach to reduce debt is economic austerity. Government expenditure is cut, or revenue raised, to depress public expenditure below revenue. If economic reforms reanimate growth, public debt as share of GDP declines even further. We study debt reduction via austerity first in Italy after World War I, and then in the euro area.

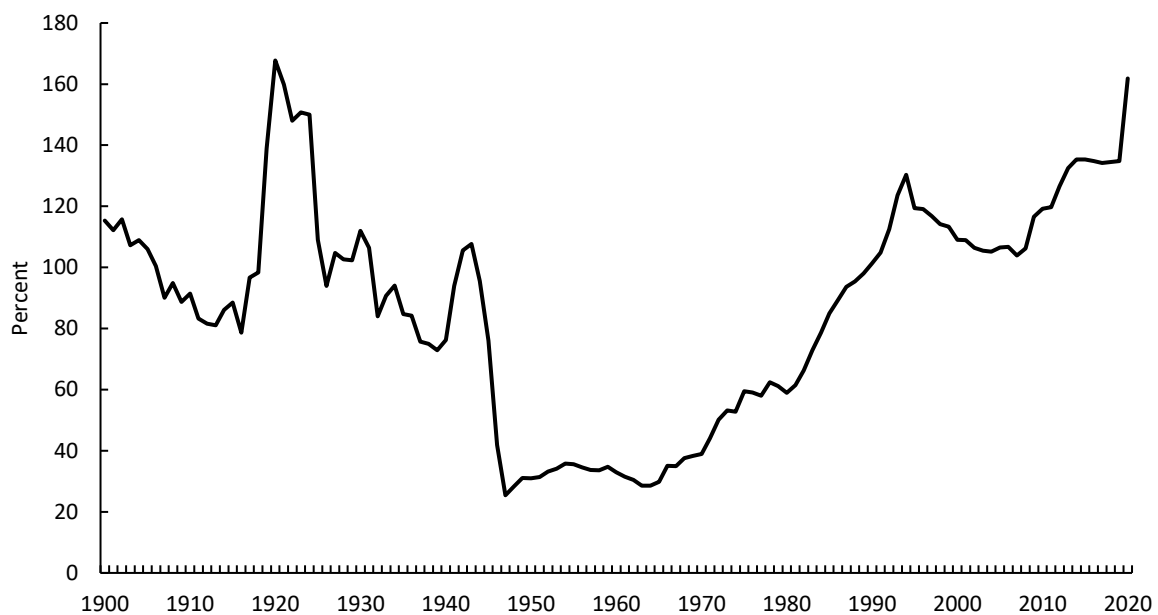
3.1 Italy After the World War I

Italy went through turbulent times in and after the World War I. It was on the winning side but had accumulated a huge debt amounting to around 180% of its gross domestic product (GDP) (Figure 3). The lira's exchange rate plummeted, and inflation rose. In October 1922, Benito Mussolini, who had founded the fascist movement in 1919, took over the government (Marinkov, 2019). He decreed a change of course in economic policy to what today would probably be called “*austerity policies*” but was labelled then “*liberal orthodoxy*”. Government spending was reduced, social spending was cut, and real wages were diminished by 20 per cent between 1921 and 1929. The fascist trade unions made it possible. Taxes on consumption were increased, while taxes on corporate profits were reduced. State-owned enterprises were privatized.

Following the collapse of the French franc in mid-1926, the lira was targeted by speculative attacks, raising widespread concern among small savers in Italy and financial circles abroad. In a highly publicized speech in August 1926, Mussolini committed his government to an outright defense of the lira: “*The lira, which is the sign of our economy, the symbol of our long sacrifices and our hard work, will be defended, and defended most firmly, at whatever the cost*” (Marinkov

2019, 183).⁴ The exchange rate policy was dubbed “Quota Novanta”, setting out the target to peg the lira at 90 to the pound sterling. The results of Mussolini’s policies were continuous surpluses of the state budget from 1923 to 1934 and a halving of the national debt ratio to around 76% of GDP by 1940.

Figure 3: Public Debt in Italy 1900-2020 (% of GDP)



Source: Abbas et al. (2010/2021).

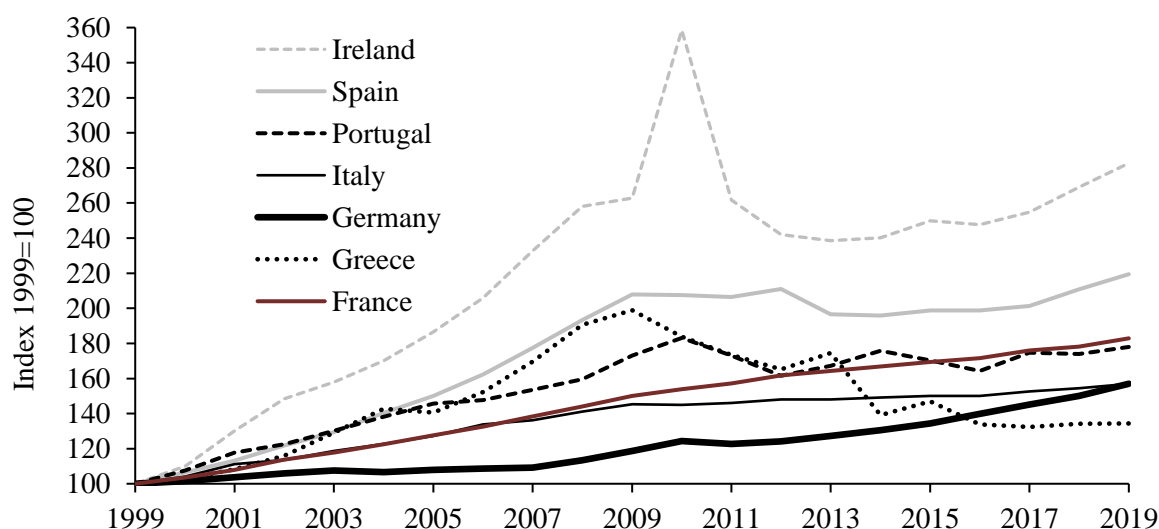
3.2 Euro Area Before and After the Great Financial and Euro Crisis

After German unification in 1990 had strongly increased public debt, the government made a big effort as of the late 1990s to consolidate public finances so as to maintain the Maastricht public debt limit of 60% of GDP. Public spending was curtailed starting in the late 1990s, and comprehensive economic reforms were launched in 2003 (under the title “Agenda 2010) by the government of Gerhard Schröder. The reforms were based on three pillars: labor market reforms, cuts of (future) social benefits, and incentives for private retirement provision (Schröder 2013).

⁴ ECB President Mario Draghi, certainly accidentally, many years later used a similar wording to stabilize the beleaguered European common currency, saying in 2012 that the ECB would defend the euro “*whatever it takes*”.

The reforms came along with stable public expenditures (Figure 4) and a prolonged period of wage restraint in the public and private sectors (Figure 5). As fiscal austerity depressed investment activity, growth declined, and tax revenues remained sluggish. The current account balance turned to a surplus as capital outflows strongly accelerated, boosted by strong interest rate cuts of the ECB⁵ combined with growing savings of households due to tax incentives. Enterprise savings were stimulated as the labor market reforms had created a large low-wage sector, which constrained overall wage increases.⁶ Only as of 2010 growth picked up and the general government debt level as percent of GDP started to decline (Figure 6).

Figure 4: Public Expenditure Paths in the Euro Area



Source: Eurostat. In Euros, 1999=100.

Complementary to the strong improvement of the German current account position after the turn of the millennium, the current account deficits of several southern as well as central and eastern European countries substantially increased, as capital inflows (originating in Germany) accelerated (Müller and Schnabl 2019). Combined with the low interest rates set by the European Central Bank, the capital inflows boosted private consumption and construction activity in the southern European countries.⁷ Fast rising tax revenues encouraged the expansion of

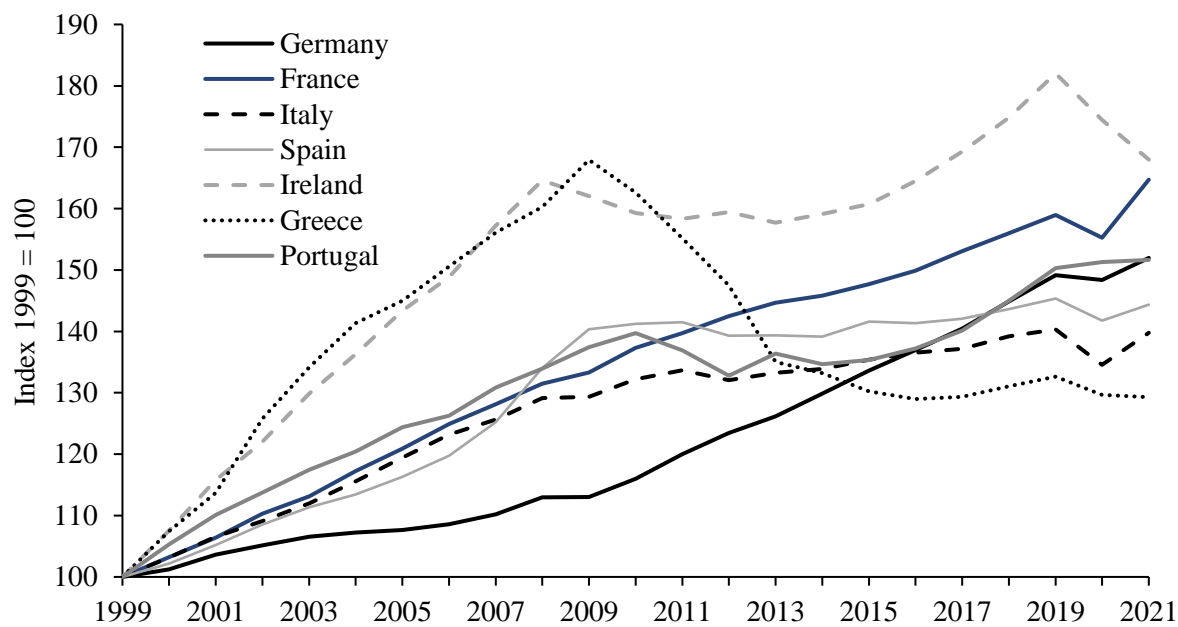
⁵ From 2001 on the ECB had strongly cut interest rates in response to the burst of the dotcom bubble.

⁶ The Schröder reforms dubbed “Hartz IV” created a low wage sector, which contributed to wage austerity in the whole economy.

⁷ Similar boom phases were observed in Ireland and some central and eastern European countries, e.g., in the Baltic countries, as well as in the United States (“subprime boom”).

public expenditures, for instance in form of growing public sector wages and social security payments.⁸

Figure 5: Nominal Wage Levels in the Euro Area



Source: OECD, IMF.

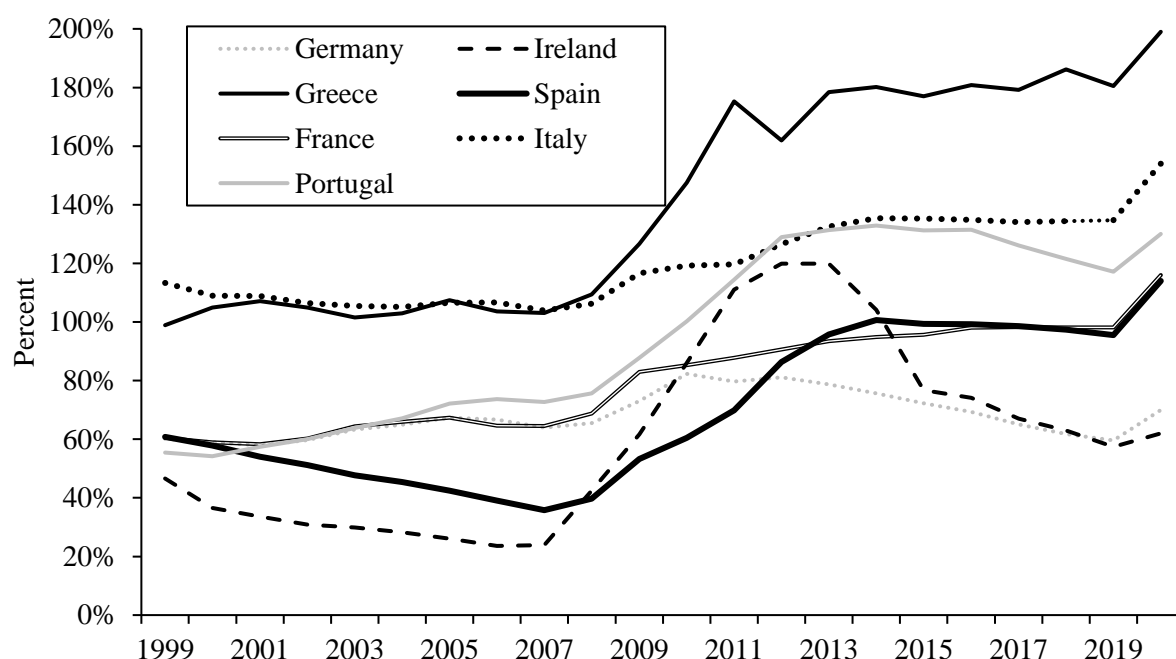
When the capital inflows into Southern and Eastern Europe abated with the outbreak of the Great Financial crisis in 2007/08, public expenditure levels and house prices proved unsustainable in the periphery of the euro area. Owing to falling house prices and soaring bad loans in domestic banks, the governments in the affected countries faced high costs of bank recapitalization. The public debt levels strongly increased (Figure 6). As they exceeded the Maastricht limit of 60% of GDP in most crisis countries, governments were forced to take fiscal austerity measures. The European Monetary Union and the Treaty on the Functioning of the European Union – Art. 121 (multilateral surveillance) and Art. 126 (excessive deficit procedure) – provided the legal framework.⁹

⁸ Thus, public austerity in Germany was mirrored by fiscal expansion and wages increases in other parts of Europe (see Figure 4 and Figure 5). Rising tax revenues contained increases of public debt levels or even allowed for a reduction of public debt in Spain and Ireland.

⁹ The fiscal austerity imposed on the crisis countries was strengthened by a reform of the Stability and Growth Pact. The “Six Pac” included both fiscal policy supervision by the Council of Ministers and sanction mechanisms. A supervision of macroeconomic imbalances aimed at forestalling new disequilibria.

Membership in the European Monetary Union prevented the euro area crisis countries from improving their international competitiveness by depreciating their currencies to lower relative real wages. Thus, all crisis countries, except Italy, had to curtail their government expenditure compared to the year 2008 (Figure 4). Nominal wages declined or remained constant. This depressed income and GDP growth and undermined attempts to reduce public debt relative to GDP.

Figure 6: Government Debt Levels in the Euro Area



Source: Statista.

The European Central Bank provided indirect financial assistance through its policy of easy money. However, instead of helping necessary adjustment, this eased pressures for reform in most crisis countries (Schnabl and Sonnenberg 2020). Government bond purchases via the Securities Markets Programme (2010-2012) and, in particular, the Public Sector Purchase Programme (since 2015) reduced the risk premiums on government bonds and thereby the interest payments of the highly indebted governments. Corporate bond purchases and (Targeted) Longer-term Refinancing Operations eased the credit conditions for banks and enterprises, thereby reducing the risks of defaults and costly public bail outs. Crisis countries encountered balances of payments deficits, but intra-Eurosystem credit provision through the TARGET2

payment system allowed the unlimited financing of these deficits at very low costs (Sinn and Wollmershäuser 2013).

Thus, fiscal tightening and the wage restraint in the post-crisis recovery period were accompanied by an easing of credit constraints via the European Central Bank. Cut-backs in private cross-border credit was largely substituted by credit provision via the ECB, the IMF and the European Commission. This postponed the restructuring of the banks and enterprises in the crisis countries and lowered economic growth. Sinn (2015) argued that the public rescue funds caused a variant of the “Dutch disease” for Greece as economic growth remained sluggish.

In Germany, the loose monetary policy of the ECB in response to the European financial and debt crisis has caused (via low interest rates) a real estate and (via euro depreciation) an export boom since 2012. This boosted tax revenues and allowed to achieve a balanced budget – labeled “*black zero*”¹⁰ - before the Corona crisis, despite a strong expansion of public expenditures (Figure 4). Debt as percent of GDP declined thanks to the benign monetary conditions, which reduced government interest payments and boosted economic activity. With the outbreak of the corona crisis in 2020, public debt strongly increased as tax revenues declined and public expenditures rose. Although debt had been lowered earlier, Germany had missed the chance to create a war chest for anticyclical fiscal policy in the corona crisis. Hence, public debt rebounded strongly again (Figure 6).

4. Exit Via Hidden Debt Reduction

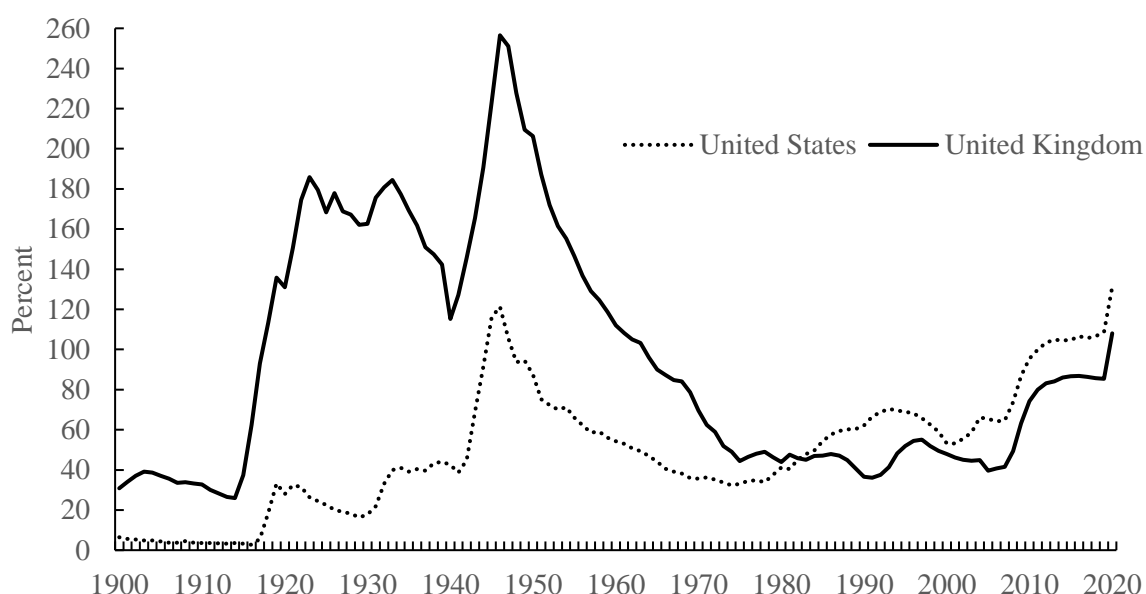
In democratic political systems, voters tend to punish policy makers for painful reforms (Buchanan and Wagoner 1977). But a backdoor to reduce real public debt without painful reforms is the inflation tax (Lerner 1955). When inflation rises above interest rates, it becomes a hidden tax on holding money balances. Interest groups, which profit from inflation and financial repression, exert pressure in favor of monetary expansion.¹¹ Given time lags in tax collection,

¹⁰ In German: “Schwarze Null”.

¹¹ For instance, Bresciani-Turroni (1937) argues that hyperinflation in Germany would not have reached the large dimension, if it had not been favored by those who drew profit from it. “*Representatives of these classes used their influence to slow monetary and fiscal reforms, as well as to sabotage all proposals for the stabilization of the German exchange. It seems certain that the industrial classes contributed greatly to the mark’s depreciation, alongside the agriculturalists, whose mortgage burden was reduced due to inflationary erosion.*” The

higher inflation reduces the real value of tax revenues (Keynes-Tanzi effect), further shifting the focus of government financing to the central bank. The process of tax collection via inflation is arbitrary (Keynes 1920, Rothbard 1994). Keeping interest rates artificially low and inflation elevated can be an adequate exit strategy, yet at the risk of paralyzing growth via zombification (Hoffman and Schnabl 2016).

Figure 7: Government Debt of the US and UK



Source: Abbas et al. 2010/2021.

Financial repression – i.e. policies that keep the return to savers below the inflation rate to allow banks to provide cheap loans to governments and enterprises – is a way to reduce government debt (Reinhart and Sbrancia 2011).¹² The United States and the United Kingdom successfully reduced their post-World War-II debt burdens by keeping interest rates on government debt (i) below the growth rate g ($i < g$).

Due to the financial burdens of World War II public debt in the United Kingdom and in the United States had increased to over 250% and over 120% of GDP, respectively (Figure 7). It

monetary reform was only accepted when, at the end, Germany faced an economic catastrophe, and it became clear that the consequences of inflation would rebound against its supporters.

¹² For today's industrialized countries Reinhart et al. (2015) propose a reduction of public debt based on financial repression, possibly combined with the abolishment of cash.

was reduced again with two measures (Reinhart and Sbrancia 2011). First, the central banks of the United States and the United Kingdom pursued interest rate targets based on guidance by their ministries of finance.¹³ Government regulation capped interest rates on savings deposits¹⁴ and put a ceiling on banks' lending rates. Second, multiple layers of regulation created a captive environment that directed credit to the government. Capital account restrictions and foreign exchange controls created a "home bias" for financial investment. "Prudential" regulatory measures required institutions to hold government debt. Transaction taxes on equities discouraged alternative investment classes.

Low interest rates on government bonds help to reduce government debt via two channels. The interest expenses on a given stock of government debt is reduced and thereby the public deficit curtailed. In addition, when combined with (moderate) inflation, low or negative real interest rates devalue parts of the existing debt stock. Elmendorf and Mankiw (1999: 1619) argue that an important factor behind the dramatic drop in US public debt between 1945 and 1975 was that the growth rate of gross national income tended to exceed the interest rate on government debt (see Figure 8).¹⁵ Reinhart and Sbrancia (2015) estimate that public debt was reduced by 3 to 4 percentage points of GDP per year via the interest and inflation effect.

At the same time, growth was bolstered by the reintegration of military personnel in the civilian sector and the application of the technologies developed during the war (Reinhart et al. 2015). In addition, the post-war reconstruction in Europe and Japan combined with extensive market-oriented reforms gave a strong boost to the global economy (Schnabl 2019b). The stabilization of exchange rates combined with the liberalization of global trade provided an important growth stimulus for the member states of the Bretton-Woods-System. European countries benefitted also from the process of European integration (Müller and Schnabl 2019).

In the emerging market economies financial repression during the same time period did not reduce public debt. McKinnon (1973) and Shaw (1973) found a negative link between financial repression and economic growth, as extensive controls over the flow of money and credit were

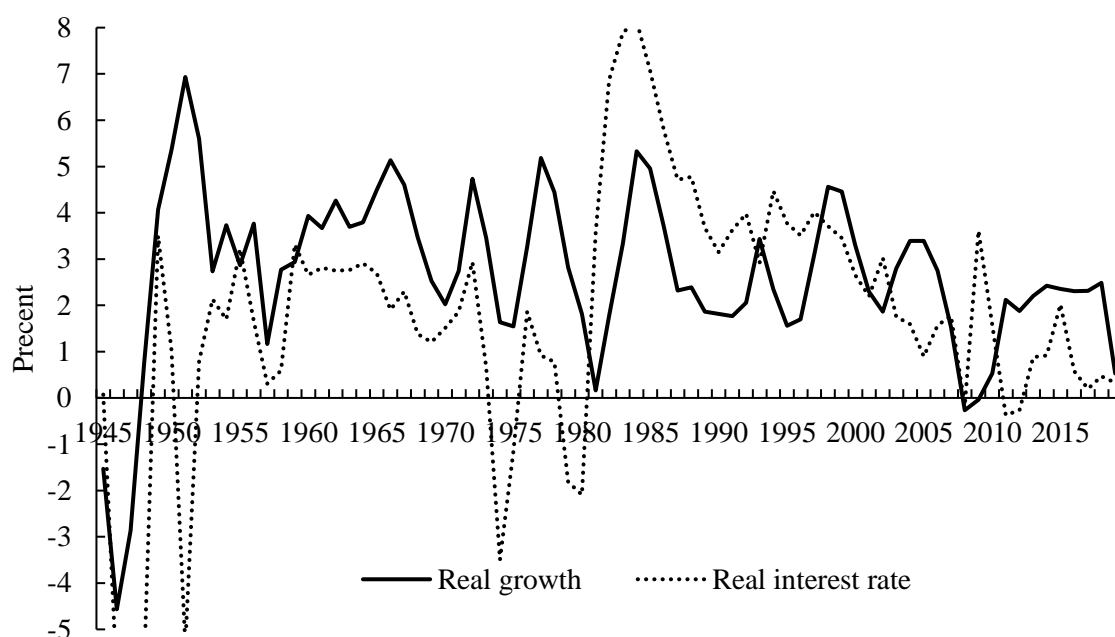
¹³ See Melzer (2002) on the United States.

¹⁴ In the US, the "regulation Q" prevented banks from paying interest on demand deposits and limited interest rates on saving deposits. This gave an incentive to hold government bonds.

¹⁵ The picture is similar for the United Kingdom.

organized to serve the governments. By keeping interest rates low the interest burdens of government debt were reduced, allowing governments to direct flow of funds with the intent to promote growth with the help of industrial policies. In the centrally planned central and eastern European economies, the banking systems provided cheap credits to enterprises to ensure plan fulfillment instead of financing productive undertakings.

Figure 8: Real Interest Rates and Real Growth in the US



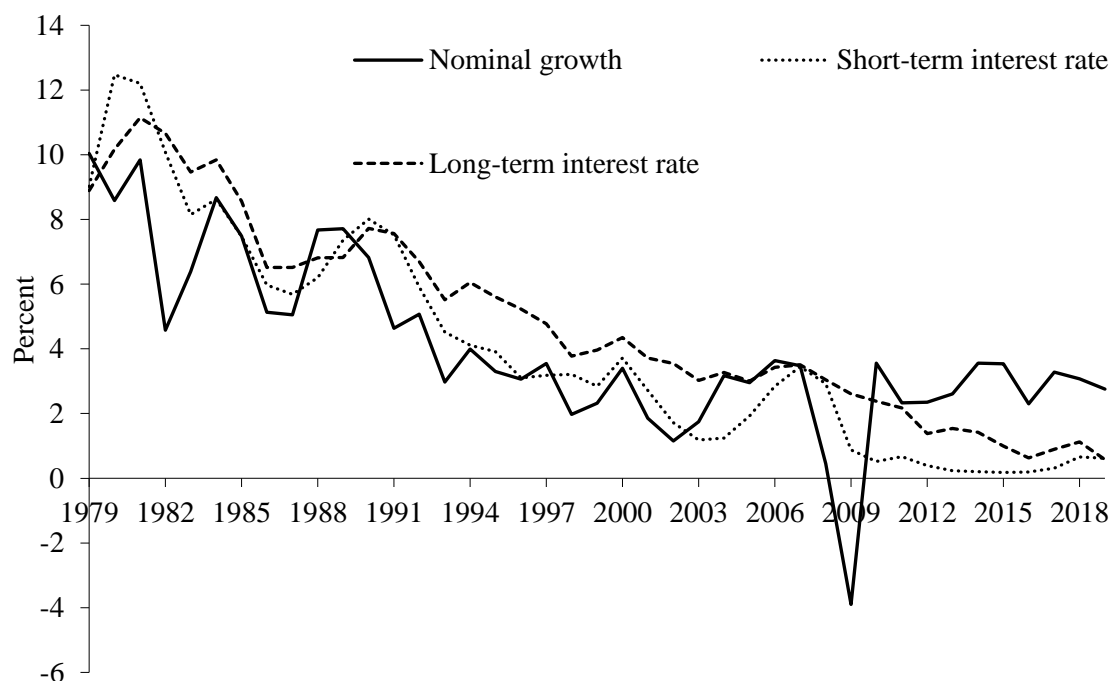
Source: US Bureau of Labor Statistics, OECD, NBER (2021). Real growth as three-year gliding average.

The interest rate controls in the developing economies came along with a repressive system of publicly guided credit allocation and price controls. The domestic capital markets were shielded off from abroad by capital and foreign exchange controls. Highly uncompetitive domestic industries – often dominated by large state-owned enterprises –, were protected by high effective tariffs, which prevented them from realizing economies of scale. The outcome was low growth - which eventually triggered financial and economic liberalization (McKinnon 1993) and the Washington consensus (Williamson 1990).

Today, conditions in the industrialized countries seem to converge to those in the less developed economies of the 1950s to 1970s. Financial repression, growing regulation and the gradual

build-up of trade barriers has come along with low growth. Growth has declined along with interest rates (Figure 9). The monetary policies of the central banks introduced a quasi-soft budget constraint on enterprises, which undermines the efficient allocation of resources and paralyses growth (Hoffmann and Schnabl 2016, Schnabl 2019a). Therefore, debt levels do not decline despite a high degree of financial repression.

Figure 9: Japan, USA, Germany: Nominal Growth Rates and Interest Rates



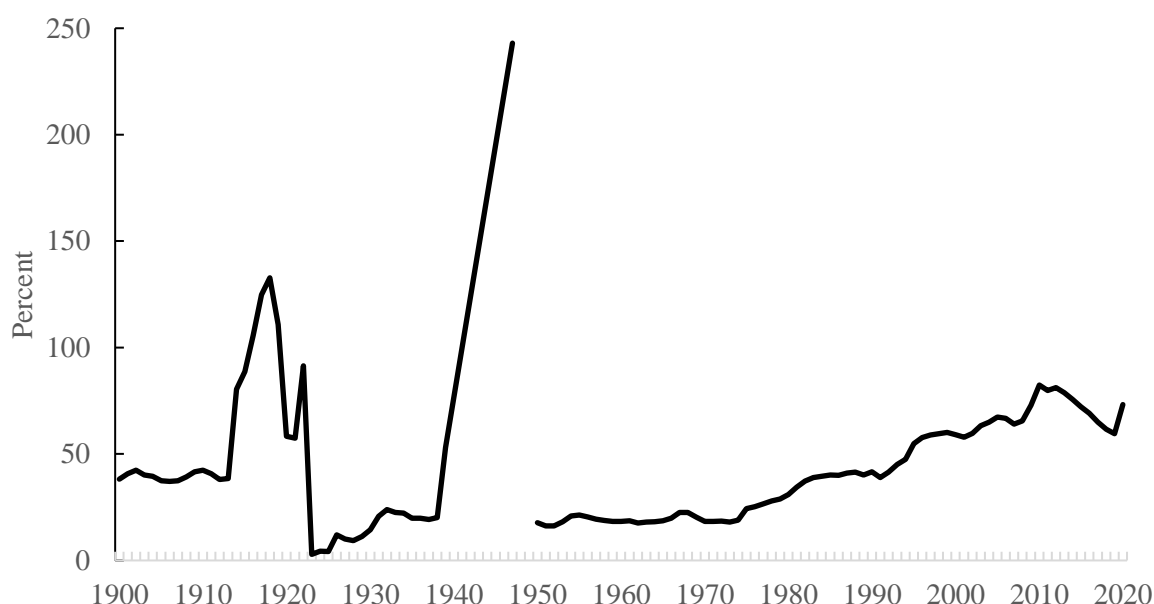
Source: IMF. Arithmetic means.

4.2. Hyperinflation with Budget Reform in Post-World War I Germany

When the process of inflation gets out of control, hyperinflation is the fast-motion version of financial repression. While financial repression leads to a gradual transfer of wealth from creditors to debtors and a gradual erosion of trust in money, hyperinflation does this at a high speed. As rising inflation reduces the purchasing power of people, it often causes wage-price-spirals (Akerlof 1969): Workers aim to maintain their real wages by pushing for higher nominal wages,

while enterprises increase prices to maintain their mark-ups of prices over wages.¹⁶ With prices rising, growing demand for money prompts central banks to increase the money supply further (Cagan 1956). As the increase in inflation accelerates, domestic currency is substituted by more stable foreign currency. The resulting depreciation accelerates inflation as prices for imported goods rise. Demand for currency declines, and even more so, when high inflation provides an incentive for barter trade. Good money drives out bad money, the opposite of “Gresham’s Law”, which Bernholz (2003) calls “Thier’s Law”.

Figure 10: Government Debt of (Western) Germany



Source: Abbas et al. 2010/2021. Between 1945 and 1990 Western Germany. The level of public debt of 243% in 1948 follows an estimation of Burret et al. (2013).

German hyperinflation of 1923 (Feldmann 1993)¹⁷ was preceded by money printing to finance war expenses in 1914 to 1918. Following the Treaty of Versailles in 1919, the German Reich had to pay large reparations to the allied victors in the form of gold, foreign exchange and goods

¹⁶ See Burdekin and Burkett (1992) for hyperinflation in Germany during the 1920s.

¹⁷ A contemporary example of hyperinflation is Zimbabwe (Koech 2011). When Zimbabwe became independent in 1982 inflation stood at 5.4% and the largest currency denomination was 20 Zimbabwe Dollars, with an exchange rate of 0.647 to the US dollar. The shift towards hyperinflation was preceded by several years of economic decline and growing public debt from 1999 onwards. Droughts and land reallocation had depressed farming output of the agriculturally dependent country (Coomer and Gstraunthaler 2011). Proliferate government expenditure, inter alia for war, prompted the government to the monetization of public debt. Economic stagnation and emigration led to a shrinking tax base. Inflation spiked, with prices being changed every day several times. The GDP per capita strongly declined. The hyperinflation led to a complete erosion of domestic government debt.

(Keynes 1920). The high public debt caused by the war further increased (Figure 10). The drop in assets on the balance sheet of the Reichsbank induced by the transfers of gold and foreign exchange would have necessitated a fall in money supply. To counter the negative impact of a monetary contraction on the economy, the Reichsbank offset the decline of gold and foreign exchange by extending credit to the government. Following a disruption in reparation payments in 1923, France and Belgium occupied the Ruhr area¹⁸, Germany's industrial heartland.

The area included 4.25 million inhabitants and was responsible for 72% of German coal production, 54% of pig iron production, and 53 % of crude steel production. The French government portrayed the intervention as a mission of engineers and officials instead of a military action. However, the "accompanying force" to this mission included a total of 100,000 French and Belgian soldiers (equivalent to the troop strength of the entire German army, the Reichswehr). They were equipped with tanks, artillery, and machine guns.

Financially supported by the government with newly created money, workers went on strike (Ahamed 2009, Kleinheyer, 2020). The Berlin government had made few preparations for this shock. Neither coal nor other raw materials had been stockpiled. Nor was it prepared financially. The government was in the middle of negotiating the 10th supplementary budget for 1920, which dealt exclusively with inflation-related pay increases for civil servants. A plan for how the massive costs associated with the Ruhr occupation could be borne was not decided until February 16, 1923.

The Ruhr occupation was to be met with passive resistance, and the government exhorted the population to protest only by peaceful means. Thus, no more coal was to be mined for the Allies, and the Reichsbahn was not to make any deliveries to France. The French reacted harshly and imposed martial law on the occupied territory. During the occupation, about 150,000 civilians - civil servants, railroad workers, policemen, employees of mines and factories - were expelled from the Ruhr area.

¹⁸ After Germany had delivered only 11.7 million tons of coal at the end of 1922 instead of the stipulated 13.8 million, on January 11, 1923.

The Berlin government stood ready to compensate entrepreneurs and workers alike for the measures of passive resistance. The entrepreneurs were reimbursed for the wages they continued to pay their idle workers, initially at 60 percent and later at 100 percent. They were also given generous credit for the losses of production and profits. The state paid the wages of Reichsbahn employees who were expelled or not employed by the French.¹⁹ To finance the costs for the wage compensations the printing presses of the Reichsbank ran around the clock. The additional money printing broke the camel's back and induced a collapse of the exchange rate. Inflation rose to 29,500% per month.

On November 12, 1923, Hjalmar Schacht was appointed currency commissioner by Hans Luther, Finance Minister in the German government of Gustav Stresemann. Schacht oversaw the introduction of a new currency, dubbed "*Rentenmark*". Owing to the shortage of gold – and the Reichsbank's resistance to hand over the country's gold reserves to the Finance Ministry – the new currency was backed by land owned by the state.²⁰ Most importantly, however, the amount issued was fixed by law at 2.4 billion Rentenmarks. The Rentenbank as issuing authority was independent from the government but backed by the strength of the German economy.

When the currency was officially introduced on November 15, 1923, it came in parallel to the Reichsmark. Thus, for a while Germany had two official currencies existing alongside each other.²¹ The exchange rate of the Reichsmark was in free fall against the US Dollar when the Rentenmark was born. On November 12, when Schacht was appointed, it stood at 630 billion Reichsmark to the Dollar. By November 15, it had reached 1.3 trillion. Schacht was urged to circulate the new Rentenmark, as it was now ready. But he held back.

¹⁹ A British journalist commented: "*Seventy percent of heavy industry is lying idle, large sections of coke and smelting furnaces have cooled down, and most of them are not worth restarting. There are indications that the German corporations are not shedding a tear over this. (...) The corporations are paid for the cooled-down furnaces by the Reich in gold values, which they immediately invest abroad, thus contributing to the further decline of the mark.*" (Kleinheyer, 2020).

²⁰ Rentenmarks could be converted into bonds denominated in gold marks that had an interest rate of 5%. These bonds were secured by a mortgage upon agriculture and industry all over Germany, denominated in gold marks (Pfleiderer 1979, 25-26).

²¹ The heads of the two issuing institutions, Rudolf von Havenstein at the Reichsbank and Hjalmar Schacht at the Finance Ministry – did not even communicate with each other.

On November 15 the exchange rate reached 2.5 trillion, without him moving. Eventually, when it had reached 4.2 trillion to the US Dollar, he issued the Rentenmark at an exchange rate of 1 trillion Reichsmark to one Rentenmark. With this he established an exchange rate of 4.2 Rentenmark per US Dollar, the rate that had prevailed under gold standard before the war. The Reichsmark continued to fall to extreme lows, trading at 11 trillion to the US Dollar by November 26.

The counterpart of the Rentenmark note issue corresponded to 2.4 billion Rentenmarks. This allowed to give a bridging loan of 1.2 billion Rentenmarks to the central government and another 1.2 billion Rentenmarks to the German economy through the extension of loans by the Reichsbank and the four “private note-issuing banks” (in Bavaria, Saxony, Württemberg and Baden). As a result, the government was able to buy back its many trillions of Reichsmark debt for only 190 millions of Rentenmark (Ahamed 2009, 189). Public debt fell to zero. The government gained the possibility to stop central-bank financed government expenditure. The independence of the Rentenbank prevented the government to issue new central bank-financed debt. In August 2024, the Reichsmark was established as new official currency unit by cancelling out 11 zeros. The Rentenmark was gradually taken out of circulation. From then onwards, a fixed exchange of 4.20 Reichsmark per dollar was used as an anchor for monetary policy making.²²

4.3. Inflation Without Budget Reform in Argentina

The strong rise of public debt in Argentina started in the early 1970s (Figure 11). Many Latin American countries, including Argentina, raised borrowing from banks in industrial countries to promote growth via industrialization.²³ Because domestic capital markets in developing countries and emerging markets have been underdeveloped (Eichengreen and Hausmann 1999) (including in Argentina), international debt has been issued mostly in foreign currency, predominantly in US dollars (and more recently in euros). By 2020, government debt of the Republic of Argentina stood at 332 billion dollars, with 76.2% being denominated in foreign

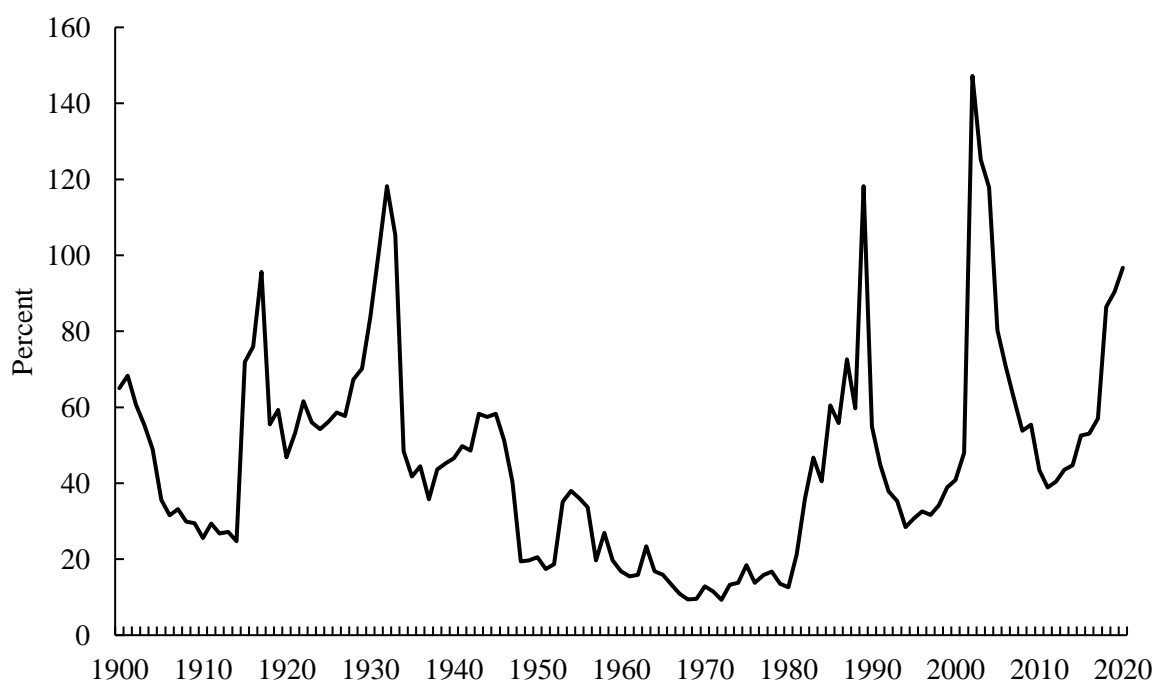
²² The most important long-run consequence of the hyper-inflation were the redistribution effects of the annihilation of all monetary assets and write-off of all monetary debts, in particular government debt.

²³ The hike of oil prices had inflated to dollar revenues of the oil exporting countries at the same time as the industrialized countries went into crisis and demand for credit fell. The banks in the industrialized countries therefore “recycled” the petrodollars of the oil exporting countries via growing credit provision to many Latin American countries.

currency (mainly dollars) and 23.6% in pesos. Since the 1980s, Argentina has inter alia gone through five types of defaults without being able to establish sound government finances.

First, peso-denominated debt not indexed to inflation, which is for instance held by the private sector, public social security institutions and the central bank, has been devalued through inflation. The accumulation of government bonds by the central bank has usually been financed by monetary expansion. This has pushed up consumer price inflation and thus reduced public debt in real terms. Inflation has been reinforced by the depreciation of the exchange rate, as prices for imported products went up. With rising inflation, nominal GDP increased, and public debt as percent of GDP declined. This was particularly the case during the debt crisis in 1990/91, 2002/03 and since 2018. Therefore, bonds denominated in domestic currency became indexed to inflation.

Figure 11: Government Debt of Argentina

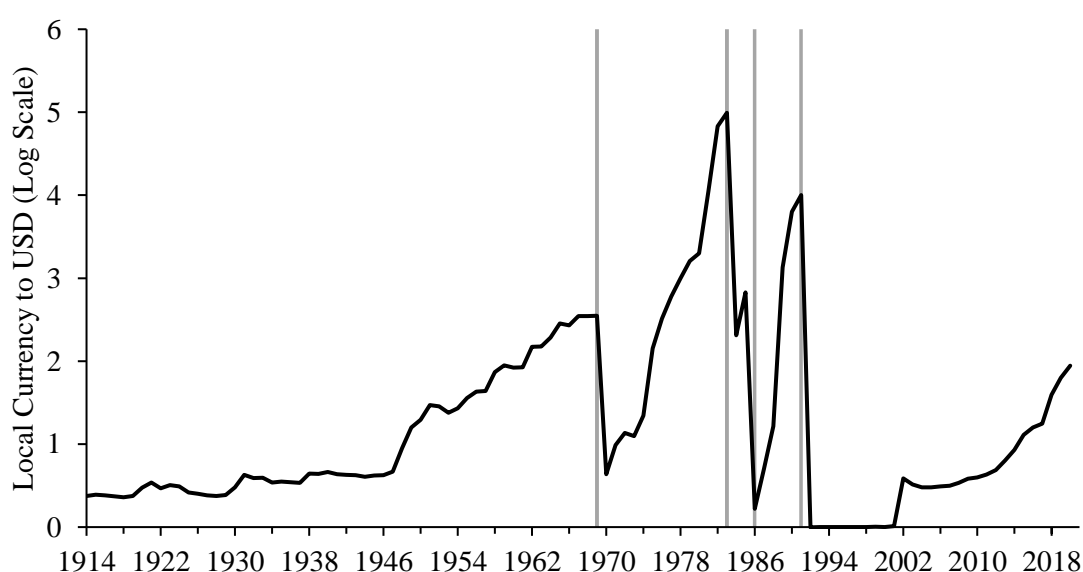


Source: IMF, Historical Debt Statistics, Clio Infra Database.

Second, foreign reserve holdings of the central bank, which it accumulated when private entities exchanged foreign against domestic currency, were swapped with the government against non-

transferable dollar-denominated bills of the Treasury of Argentina.²⁴ The non-transferable bills held by the central bank in exchange for its reserves are quasi worthless, because they cannot be sold and maturing bills are usually substituted by new bills on instruction by the government. The peso liabilities created by the central bank to purchase the foreign exchange were devalued in real terms via inflation. Thus, the government received foreign exchange to service its debt at the expense of the private sector.

Figure 12: Argentina: Local Currency to US Dollar



Source: Foundation Norte y Sur. Log Scale. Vertical lines indicate currency reforms in the years 1969, 1983, 1985 and 1991.

Third, capital inflows and the accumulation of government debt usually create inflationary pressure via monetary expansion and bank credit growth.²⁵ In periods of macroeconomic stabilization – which helps to attract international credit – central banks can sterilize the monetary effects of foreign exchange intervention and the acquisition of public debt by selling bonds held or created by them. The sterilization is often combined with capital controls to prevent additional capital inflows triggered by interest rate increases. Interest rates on bonds tend to be held

²⁴ In the case of exchange rate stabilisation the central bank acquires foreign exchange reserves, when dollars are converted into peso. Important sources of dollar inflows have been export-revenues, in particular in the agricultural sector, and international credit.

²⁵ Under a fixed exchange rate regime and in case of a central bank dependent on the government, both forms of balance sheet expansion can be seen as being outside the responsibility of the central bank.

artificially low²⁶ and domestic banks forced to purchase bonds from the central bank. Thus, the costs of the sterilization process are shifted to the private banks (Löffler, Schobert und Schnabl 2010). The private banks in Argentina have been forced to shift the resulting burdens to their customers, either in form of higher lending and/or reduced deposit rates.²⁷ When inflation rises, the real value of the central bank bonds decline.

Forth, the depreciation pressure on the domestic currency has often been contained by outward-bound capital controls and foreign exchange restrictions (*trabos*) to strengthen the peso. In practice, genuine reasons for acquiring foreign exchange have to be given and there are limits on foreign exchange purchases. Multiple exchange rates have been a form of distributing the costs of inflation to different parts of the population, in particular confiscating wealth from the export-oriented sectors, such as farmers, for the benefit of domestic sectors, for example circles close to the government. In practice, the foreign-currency revenues from exports had to be surrendered to the government and the peso-equivalent of export revenues tended to be converted into pesos below the market exchange rate. Farmers aiming to acquire dollars, for instance to stabilize the value of their savings, had to purchase dollars at a more unfavorable exchange rate than the market rate.

Fifth, as dollar debt held in foreign countries can neither be reduced by inflation nor by exchange rate depreciation²⁸, outright defaults and debt-write-offs have inter alia occurred in the years 1982, 1989, 2001 and since 2020.²⁹ The international defaults were preceded by longer periods of capital inflows and increasing international debt. Strong depreciations (see Figure

²⁶ Otherwise, the interest rate would go up and attract additional capital inflows, which would further increase foreign debt.

²⁷ In March 2021 the outstanding amount of bonds issued by the Central Bank of Argentina stood at 38 billion dollars, equivalent to about 23% of total assets.

²⁸ As the foreign debt of the United States tends to be denominated in domestic currency, it can be devalued in real terms via dollar depreciation. This has created the exorbitant privilege of a quasi-unlimited line of credit for the United States (McKinnon 2012).

²⁹ The first sovereign default after World War II occurred in 1982, following the ever-growing economic dislocations under the military governments and finally the Falkland war. The second default occurred in 2001 with the collapse of the currency board regime, after two IMF programs known in Argentina as “Blindaje” and “Megacanje” had failed. 72,2% of the outstanding debt was successfully restructured in 2005. In 2010 the percentage of restructured debt reached 93%. The remaining creditors were three funds (NMC Capital, EM and Elliott), which after several trials in New York and a decision of the Supreme Court of the United States forced Argentina into a selective default in 2014. The latest default started in 2019 with the forced extension of local debt payments and the default on external debt in 2020. The restructuring is still ongoing. Most recently, the vice president of Argentina claimed that the country cannot repay its 43 billion dollar-debt to the IMF. See also Cachanosky and Thomas (2016).

12) inflated dollar-denominated debt in terms of domestic currency.³⁰ The crises were usually resolved by the restructuring of international debt and the provision of international public credit, inter alia by the IMF.³¹ By early 2020, Argentina's debt to international multilateral public institutions stood at 73 billion US dollars. This implies that the burden of restructuring has been shifted to the taxpayers in the industrialized countries.

5. Cold Turkey Strategies

As long as government expenditures are high, the pressure on central banks to contribute to government financing is strong. Therefore, in the past, currency reforms were combined with a fundamental restructuring of government expenditures, a changing of the status of the central bank, and market-based economic reforms.

5.1 1948 Economic and Currency Reform in Western Germany

In early 1948, the German economy was in dire straits.³² As a result of extensive war damage, manufacturing production was less than 60% of its 1936 level and real per capita consumption was about two thirds of what it had been then; there was a severe scarcity of most basic goods. Moreover, war financing had left the "Third Reich's" public debt at the end of the war at almost 248% of 1939 GNP (Figure 10) and had created a vast amount of excess liquidity. The Reichsmark (RM) had lost its function as a means of exchange, and barter trade had become the order of the day. Black markets undermined the system of price and wage controls and the publicly controlled production and distribution of goods. There was no incentive to work for money. Imported goods quickly disappeared from the regular markets and exporting was unprofitable since foreign currency receipts had to be surrendered against Reichsmarks.

³⁰ See Flood and Garber (1984) on first generation balance of payments crisis models.

³¹ "Restructuring" consists of a reduction ("hair-cut") of outstanding debt with or without the agreement of creditors and assistance of a third party. The latter came to prominence in the late 1980s in an effort to finally solve the Latin American debt crisis that had erupted in the early 1980s. The US government issued bonds to debtor countries (dubbed "Brady Bonds"), which they could offer to creditors in exchange for a reduction in claims against them. Thus, debt restructuring was facilitated by compensating creditors for debt forgiveness by a higher quality of their remaining claims.

³² This description of the German currency reform of 1948 is based on Mayer and Thumann (1990). See also Schnabl (2019b).

In principle, the monetary overhang could be reduced either by allowing prices to rise while keeping the supply of money unchanged, or by cutting the nominal money supply through currency reform while keeping prices unchanged initially. Because of the political circumstances of the time, and, probably, Germany's experience of hyperinflation after World War I³³, currency reform was selected as the appropriate approach. The controlled reduction in the money supply would mop up excess liquidity and reduce the risk of an inflationary spiral. It would also allow accompanying measures to offset, at least in part, the redistribution of wealth resulting from monetary reform. The economic reforms combined with the currency reform were facilitated by the military occupation, as the occupying forces had a monopoly of political power (Pfleiderer 1979).

Any currency reform that involves a substantial and sudden reduction of monetary assets of the private sector essentially amounts to a partial or complete default by the public sector. This has far-reaching implications for the relationship between creditors and debtors in the economy at large. A currency reform is therefore far more than the exchange of new money against old money at an arbitrarily determined exchange rate; it implies a comprehensive restructuring of the whole economy. The American architects of the German currency reform plan, known as the "Colm-Dodge-Goldsmith-Plan" (Colm et al. 1955) had to deal with three broad issues: (1) the design of the reform; (2) its sequencing and implementation; and (3) accompanying measures (Metzler 1979).

(1) A crucial step was to establish an exchange rate between the old currency and the new currency, the Deutsche Mark (DM), that would preserve the internal as well as the external stability of the new currency. Cash and demand deposits of the nonbank sector (M1) had increased by almost 500 percent between 1935 and 1945, while GNP had dropped by more than 40 percent. This enormous increase in money supply had been accompanied by a price and wage freeze from 1939 onwards and a system of rationing. As a result, a huge monetary overhang had emerged.

³³ Pfleiderer (1979) provides a comparison of the currency reforms of 1923 and 1948. He mentions the "*Miracle of the Rentenmark*" (1923) and the "*German Economic Miracle*" (1948).

To restore velocity to its 1935 level, which was considered normal, M1 had to drop by 90 percent. The architects of the reform, therefore, proposed that one DM be exchanged for ten RM in the hope that this would establish the existing price level as the new equilibrium price level. The exchange rate of the new currency against other currencies would, in principle, reflect relative prices prevailing at the time of the currency reform. Purchasing power parity of the Reichsmark at existing (official) prices was estimated at RM 3 per US dollar in 1948. Allowing for some likely increases in the price level after currency reform, the exchange rate of the Deutsche Mark was therefore set at DM 3.33 per US dollar.

The authors of the currency reform plan suggested that the 90 percent reduction formula be applied to all liabilities of the banking system to the private nonbanking sector³⁴ but, for political and psychological reasons, to annul all liabilities to the government and the Nazi party. Having thus established the consolidated liabilities of the banking system, the restructuring of the assets would be straightforward. While domestic credit to the private sector was to be converted into DMs at the same rate as bank liabilities, all credit to the previous territorial authority, the Reich, was to be annulled and replaced by debentures of the federal states.³⁵ The value of these assets was to be determined in such a way that the total assets of the banking system would cover total liabilities plus an appropriate amount of equity.

The plan used the same exchange rate between the RM and the DM for liabilities and financial contracts of private nonbanks, so that debts in DM terms were reduced to one tenth of their level in RMs. The redistribution of wealth resulting from the devaluation of monetary assets was to be corrected by a system of taxes and transfer payments. For all current payments, such as wages, rents, and taxes, as well as for prices of goods and services, parity between RM and DM was established. This was necessary to achieve the desired reduction in real money balances.

(2) To facilitate conversion into DM, all outstanding cash would be collected in bank accounts. The converted funds were to be released in several installments after the tax authorities examined and established the legality of the RM holdings. However, to avoid a prolonged disruption

³⁴ In addition, half of the 10%, i.e. 5%, had to be transferred into “blocked accounts”. Later, 1.5% could be used freely, whereas 3.5% were cancelled. This implied that deposits at banks were written down to 6.5%.

³⁵ The so-called “equalization claims” (Ausgleichsforderungen) were constructed as debt of the Länder and were bearing a low interest rate.

of economic activity by the exchange process, a DM advance was to be paid to households—at a flat rate—and to businesses, based on the number of employees. For a limited period, a moratorium was to be declared on all RM payment obligations.

(3) Given the structural problems left from the centrally directed war economy and the sharp changes implied by the proposed currency reform, Colm et al. (1955) stressed the need to implement a set of accompanying measures to improve the supply side of the economy and to correct the anticipated wealth redistribution of currency reform. The depreciation of all monetary assets and liabilities by 90 percent would, at a given level of prices for goods and real assets, create large windfall gains for net monetary debtors possessing goods and real assets at the expense of net monetary creditors.

The Colm-Dodge-Goldsmith plan proposed to tax these gains, at a rate of 100 percent payable in annual installments, in the case of all private debtors and to transfer the proceeds to a special burden equalization fund (*Lastenausgleich*). A further tax, at a rate of 50 percent levied in the same way, on the remaining net assets was suggested to equalize the burden of war destruction and displacement.³⁶ In effect, these taxes were designed so as to redistribute purchasing power derived from past wealth to purchasing power derived from labor and business activities.

Specifically, it was envisaged that nontradable, interest-free claims against the assets of the burden-equalization-fund would be issued to those who had incurred losses as a result of the war and the currency reform. Redemption of these claims would depend on the funds available and the type of loss suffered. Thus, the authorities were given two instruments to determine the eventual amount of compensation granted to an individual, the recognized loss, and the waiting period for the payment of compensation. The Colm-Dodge-Goldsmith-Plan was implemented in the summer of 1948 with relatively few modifications.

It was flanked by a comprehensive economic reform including price liberalization, which constituted a market economy in Germany. The reforms were based on the constitutive principles

³⁶ The levy could be paid into the equalization fund in up to 120 quarterly installments, i.e. it could be spread over 30 years. Spread over 30 years, the charge was 1.67% per year, so that it could be paid out of the capitalized value of the assets concerned without having to attack the substance of the assets.

of a market order by Eucken (1952) and implemented by Ludwig Erhard (1958) against political resistance. The currency and economic reform became the fundament of the postwar economic miracle, as the role of the government was contained and competition enhanced on the back of currency stability (Schnabl 2019b). The resulting economic miracle facilitated the payments into the burden equalization fund.

5.2 McKinnon's Order of Economic and Financial Liberalization

McKinnon (1973) and Shaw (1973) had found that state intervention in financial markets in form of usury interest rate restrictions, heavy reserve requirements on bank deposits, compulsory credit allocations, capital controls and protectionism (i.e. financial repression) had adverse consequences for real capital allocation and growth. Financial liberalization was seen as an important pre-requisite to reanimate growth. But financial liberalization combined with monetary expansion created financial exuberance and crises, as banks tended to take too much risk in credit provision (McKinnon 1993a, 84-91).

Therefore, McKinnon (1993a, 1-30, 1993b) developed an order of economic and financial liberalization. He saw fiscal and monetary control as a prerequisite of dismantling interventionist policies to provide an *“active constraining influence on the ability of decentralized enterprises, households, and even local governments to bid for scarce resources”*. This implied as a first step the consolidation of central government finances including the elimination of off-budget government spending outside parliamentary control. To gain fiscal control, McKinnon (1993, 4) proposed a threshold to government expenditure as percent of GDP and the built-up of efficient tax systems. The implementation of hard fiscal constraints was seen as a prerequisite for a tighter monetary policy to avoid fiscal dominance in the future.

The second step in the liberalization strategy was to free domestic capital markets so that depositors receive and borrowers pay substantial (inflation adjusted) interest rates, which McKinnon (1993) only regarded to be possible under a stable price level. Interest rate payments by highly indebted enterprises should be enforced. The banking system should be freed from high reserve requirements and guidance on setting interest rates. The deregulation process of banks and financial markets should *“be carefully geared to the government's success in achieving*

overall macroeconomic stability” (McKinnon 1993, 6) to minimize the probability of bank panic and financial break downs. The bad loans of commercial banks were seen to make a recapitalization necessary.

The third step was to establish a framework of commercial law in which private debt contracts are adjudicated and, if necessary, enforced by the state for all citizens and enterprises. The fourth step was the international liberalization, of trade, capital flows and foreign exchange transactions, with the liberalization of trade taking place earlier than capital flows.³⁷ McKinnon’s (1993) order of economic and financial liberalization reflects the path taken in post-WWII Western Germany. It can be also seen as a reflection of the transformation process of the central and eastern European planning economies in the early 1990s, which – despite many deficiencies – substantially boosted growth and income levels in the region.

5.3 Chicago Plan and Central Bank Digital Currencies

An innovative technique for government debt reduction through monetary reform was proposed in the so-called Chicago plan of 1933 (Fisher, 1935). In the credit money system, bank money (i.e., money on bank deposits) is backed by a rotating stock of credit. It is created when banks extend credit, and it is destroyed when credit is repaid (or lost). Credit crises occur when the process of rotation is interrupted (e.g. by mass defaults of debtors). The authors of the Chicago Plan proposed to replace the rotating stock of credit by commercial banks to private and public debtors by a fixed stock of government bonds held by the central bank. In this way, a large part of (net) government debt can be taken out of the market and permanently placed on the central bank’s balance sheet.

In the wake of the financial crisis the Chicago Plan and related ideas have received renewed attention (Mayer 2018, Benes and Kumhof 2012). However, the plan comes at a price in the form of a change in the way money is created. Money creation through credit extension by private banks is replaced by money creation through credit to the government by the central

³⁷ In today’s globalized world, trade, capital and foreign exchange flows remain liberalized and there are adequate legal frameworks, which can be enforced. This would imply a two-step liberalization process: Fiscal consolidation and monetary tightening preceding financial liberalization.

bank. So far policy makers have apparently deemed this price too high to pay and have shied away from money reform. Nevertheless, it is worthwhile to consider it, especially as it could be combined with the introduction of central bank digital currencies to reduce government debt outstanding in the market.

For instance, a digital euro fully backed by claims on governments would have five important advantages: (1) a safe European common currency without the need to create political union; (2) a monetary order less prone to investment boom-bust cycles; (3) an end to the sovereign-bank doom loop; (4) the establishment of the euro as a key international currency; and (5) a reduction of public debt outstanding in the market.

The first step towards the euro as digital central bank money would be to create a euro bank deposit, which is fully backed with central bank money. The European Central Bank could create the central bank money necessary for covering the deposit by purchasing government bonds (as proposed in the Chicago Plan).³⁸ The ECB has done this since 2015 to increase the money supply. However, the secure deposit would replace existing deposits without increasing the money supply. When owners of existing deposits transfer their money to a secure deposit the sum of deposits and hence money supply remains unchanged. Banks could obtain the reserves needed to back secure deposits by selling government bonds they already hold to the ECB. Or they could buy government bonds in the markets against other assets they hold. Where needed, the ECB could accept other bank credit than government bonds from banks in exchange for reserve money and replace these claims with government bonds when they are redeemed. Thus, a secure deposit and asset as safe as banknotes would be created without any form of state backing needed.³⁹

³⁸ When the central bank wants to buy a bond, it pays a commercial bank central bank money in its account to create a deposit, with which the commercial bank can buy the bond in the market. When the bond has been bought and delivered to the central bank, the latter has a claim in the form of the bond and a liability in the form of central bank money. The commercial bank has a claim in the form of central bank money and a liability in the form of deposit money. Thus, the latter can now be fully backed with central bank money. The previous bond holder has exchanged his bond against a bank deposit.

³⁹ Note that this looks similar but is different from the idea of “narrow banking”. There, banks are supposed to invest existing deposits in safe and liquid assets. Nothing is said about how these deposits come into existence (see, e.g., Acharya (2003)). Here, we are concerned with the way safe deposits can be created in the first place.

In a second step, the secure euro deposit could be consolidated on the ECB's balance sheet and set up as digital central bank money that can be transferred peer-to-peer using Distributed Ledger (Blockchain) technology.⁴⁰ Thus, the euro would become an "asset token"⁴¹, backed solely by government bonds. Embedded in the token could be a "smart contract" stipulating the nature of its backing and rules for the creation of new tokens (see below). The smart contract would be tantamount to a digital watermark identifying the token as a valid euro. Entities tasked with proofing transfers of tokens in the blockchain (so-called "nodes") would only validate a transfer if the token under review was created according to the rules laid down in the smart contract. A token found in a proof of a transaction not to have been created according to the rules embedded in the smart contract would be treated as counterfeit money. Only the European Central Bank (and not the commercial banks as in the credit money system) would be responsible for issuing digital euro tokens. For users accustomed to paper money, the ECB could of course exchange digital euros at parity into bank notes.

The future increase in the money supply would take the form of additional purchases of government bonds by the ECB. Purchases would have to be decided by the ECB Governing Council independently of political influence and from a long-term perspective. For instance, in the spirit of Milton Friedman's "k-percent rule", growth of the digital euro money supply could be geared to the expected long-term growth rate of real gross domestic product (the growth potential of the euro area economy).⁴² Contrary to conventional wisdom and in line with the experience in Japan, inflation expectations of zero would not seem to be a problem. But a small rate of depreciation of money could be added to the money growth rule if actual developments proved this wrong.

⁴⁰ The secure euro deposit at the commercial bank is fully covered with central bank money. Hence, the central bank can offer to take over the deposit from the commercial bank together with the asset covering it. The latter would have an incentive to accept the offer as it would no longer have to bear the costs of executing customer transactions from the secure deposit.

⁴¹ An asset token is a digital claim on an asset. Asset tokenization makes it possible to issue digital euros as claims on stripped government bonds held by the ECB. Theoretically the owner of the token could exchange it at the ECB for the residue (principal) of a stripped government bond. However, as the transaction would incur a fee and the stripped bond is less liquid than the token, he would have no economic incentive to undertake the exchange.

⁴² This would differ from the concept of Nakamoto (2008), where the Bitcoin money supply has a ceiling.

Instead of through bank lending, money supply would be expanded by increasing ECB holdings of government bonds. To avoid money creation for fiscal policy purposes (as proposed by Modern Monetary Theory), governments would be obliged to distribute the money they receive from the bond sales directly to their citizens as a "money dividend". Any euro area government violating this obligation (stipulated in the smart contract embedded in the euro) would engage in distributing counterfeit money, automatically no longer qualify for bond sales to the ECB, and hence not receive new money for distribution to its citizens.

Commercial banks would now have to broker their customers' savings deposits in the form of digital euros to investors. In other words, banks would collect digital euro deposits on the liability side of their balance sheets and lend them against interest to debtors, with credit entered on the asset side. Thus, interest rates would be determined by the demand for funds for investment purposes and the supply of money savings in the credit market. Banks would resemble an investment fund whose assets are protected against first loss by an equity cushion. Savers could choose the bank that suits them according to their preferences for returns and first loss protection. The central bank would no longer manipulate interest rates to control banks' credit money creation. Commercial banks could continue to create private debt money through lending, but there would be no state guarantee for conversion at parity into digital euros. Money would no longer be an instrument for discretionary economic policy. But in view of the new impotence of monetary policy, this would hardly matter.

Since government debt would be used for backing money with an asset, digitization of the euro offers the possibility to reduce the gross debt of the euro states and end the sovereign-bank doom loop. Recall that the central bank buys government bonds to create the central bank money for the secure deposit, which can be transferred peer-to-peer in the blockchain. Thus, government bonds on the central bank's balance sheet to back the outstanding (digital) central bank money are permanently taken out of the market. In the third quarter of 2020, euro area government debt amounted to EUR 11 trillion or 92% of GDP. At the end of 2014, before the ECB embarked upon the policy of quantitative easing, sight deposits amounted to EUR 5 trillion. Extrapolation of the trend to the end of 2020 puts the stock of sight deposits not inflated by the ECB's policy actions at EUR 6 trillion.

In order to back the sight deposits reflecting the longer-term need of the economy with reserve money, the ECB could acquire EUR 6 trillion government bonds against reserve money in total (i.e., some EUR 3 trillion in addition to its existing holdings), and keep these bonds on its balance sheet. Since the stock of bonds is permanently required as cover for the money stock, repayment would be suspended. Moreover, as interest income from the bonds would be returned to governments anyway, coupons could be reset to zero. With a zero coupon and infinite maturity the bonds would cease to count as government debt. Hence, outstanding market debt of euro area governments would fall to EUR 5 trillion or 42% of GDP.

Digitization could be combined with a “New Deal for the euro”: The fiscally conservative northern countries with lower debt levels would agree to the one-off monetization of old debt on the balance sheet of the ECB for the creation of the secure deposit. In return, the higher indebted southern countries would accept that after the one-off monetization of their old debts, a renewed monetization of national debts would be impossible. Thus, the ECB would buy government bonds in amounts to reduce the debt ratio of each EMU country to the same level of 42% of GDP (based on end-2020 data). The higher indebted southern countries would receive a larger amount of debt relief than the fiscally conservative northern countries with lower debt levels. But as all euro member countries would benefit by getting new room for prudent fiscal policy, all euro area countries would gain.

With the rules for establishing the digital euro and augmenting the money supply embedded in the smart contract of the asset token, it would be impossible for governments to force the ECB to monetize future debt. Governments in payment difficulties could of course issue their own fiscal money (as has been contemplated by the governments of Greece and Italy at various points in time). But any money issued in breach of the contract and called euro would simply be counterfeit money (like issuing counterfeit central bank notes).

Europeans use American platform companies to communicate and shop on the Internet. They use the US Dollar for a large part of their international payments. They may in future have to use a cryptocurrency managed predominantly by American platform companies with global reach when they want to pay with digital money. For there is hardly a European company suitable to join the Association created by Facebook to issue and manage Libra/Diem, the

envisaged private cryptocurrency capable of attracting a global community of users. Or they may have to use a digital currency issued on behalf of the Chinese government, as China has announced to develop a digital currency, which it may well roll out on a global scale. A digital euro would significantly reduce Europe's dependence on the US Dollar as a means for international payments and create a formidable competitor for other global digital currencies likely to emerge in the intermediate future.⁴³ All global users would benefit when several currencies compete for their favor.

6. Outlook

Central banks' policies of very low interest rates over a prolonged period have increased economic, financial and political fragility, akin to the era of financial repression in the less developed economies during the 1950s to 1970s. It is difficult so see how an exit from this policy can be engineered without causing severe disruptions. Since any deliberate policy change would be fraught with big risks, the most likely response of policy makers is inertia and procrastination. Consequently, they will be driven by events rather than anticipating them.

The historic examples show that in the past episodes of excessive government expenditure financed by central banks have led to regime changes followed by monetary **and** fiscal consolidation. At the current levels of government debt, an exit from low interest rates is only possible, if debt of the highly indebted governments is reduced. In addition, to exit from financial repression central banks must be shielded from the pressure to bail out shaky financial institutions.

Therefore, a combination of debt-reduction based on central bank digital currencies combined with McKinnon's (1993) order of economic and financial liberalization would seem advisable. A regime change to 100% money as proposed in the Chicago Plan has never been tried. However, in view of the digitization of central bank money it would offer a less painful way to debt reduction and monetary consolidation than all the other regime changes of the past. The rule of a fixed growth of money supply would impose the necessity of reforms as proposed by McKinnon (1993) with respect to fiscal consolidation and financial liberalizati

⁴³ Carney (2019), Governor of the Bank of England, has recently proposed digital central bank currencies as competitors to the US Dollar.

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