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ABSTRACT

Historically, periods of high indebtedness have been associated with a rising incidence of default or restructuring of public and private debts. A subtle type of debt restructuring takes the form of "financial repression." Financial repression includes directed lending to government by captive domestic audiences (such as pension funds), explicit or implicit caps on interest rates, regulation of cross-border capital movements, and (generally) a tighter connection between government and banks. In the heavily regulated financial markets of the Bretton Woods system, several restrictions facilitated a sharp and rapid reduction in public debt/GDP ratios from the late 1940s to the 1970s. Low nominal interest rates help reduce debt servicing costs while a high incidence of negative real interest rates liquidates or erodes the real value of government debt. Thus, financial repression is most successful in liquidating debts when accompanied by a steady dose of inflation. Inflation need not take market participants entirely by surprise and, in effect, it need not be very high (by historic standards). For the advanced economies in our sample, real interest rates were negative roughly ½ of the time during 1945-1980. For the United States and the United Kingdom our estimates of the annual liquidation of debt via negative real interest rates amounted on average from 3 to 4 percent of GDP a year. For Australia and Italy, which recorded higher inflation rates, the liquidation effect was larger (around 5 percent per annum). We describe some of the regulatory measures and policy actions that characterized the heyday of the financial repression era.

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I. Introduction

"*Some people will think the 2 ¾ nonmarketable bond is a trick issue. We want to meet that head on. It is. It is an attempt to lock up as much as possible of these longer-term issues.*"

Assistant Secretary of the Treasury William McChesney Martin Jr.
FOMC minutes, March 1-2, 1951
Remarks on the 1951 conversion of short-term marketable US Treasury debts for 29-year non-marketable bonds. Mr. Martin was subsequently Chairman of the Board of Governors, 1951-1970.

The decade that preceded the outbreak of the subprime crisis in the summer of 2007 produced a record surge in private debt in many advanced economies, including the United States. The period prior to the 2001 burst of the "tech bubble" was associated with a marked rise in the leverage of nonfinancial corporate business; in the years 2001-2007, the debts of the financial industry and households reached unprecedented heights.[1] The decade following the crisis may yet mark a record surge in public debt during peacetime, at least for the advanced economies. It is not surprising that debt reduction, of one form or another, is a topic that is receiving substantial attention in academic and policy circles alike.[2]

Throughout history, debt/GDP ratios have been reduced by (i) economic growth; (ii) a substantive fiscal adjustment/austerity plans; (iii) explicit default or restructuring of private and/or public debt; (iv) a sudden surprise burst in inflation; and (v) a steady

[1] The surge in private debt is manifest in both the gross external debt figures of the private sector (see Lane and Milesi-Ferretti, 2010, for careful and extensive historical documentation since 1970 and Reinhart http://terpconnect.umd.edu/~creinhar/ for a splicing of their data with the latest IMF/World Bank figures) and domestic bank credit (as documented in Reinhart, 2010). Relative to GDP, these debt measures reached unprecented heights during 2007-2010 in many advanced economies.

[2] Among recent studies, see for example, Alesina and Ardagna (2009), IMF (2010), Lilico, Holmes and Sabeen (2009) on debt reduction via fiscal adjustment and Sturzenegger and Zettlemeyer (2006), Reinhart and Rogoff (2009) and sources cited therein on debt reduction through default and restructuring.

dosage of financial repression that is accompanied by an equally steady dosage of inflation. (Financial repression is defined in Box 1) It is critical to clarify that options (iv) and (v) are only viable for domestic-currency debts. Since these debt-reduction channels are not necessarily mutually exclusive, historical episodes of debt reduction have owed to a combination of more than one of these channels.[3]

Hoping that substantial public and private debt overhangs are resolved by growth may be uplifting but it is not particularly practical from a policy standpoint. The evidence, at any rate, is not particularly encouraging, as high levels of public debt appear to be associated with lower growth.[4] The effectiveness of fiscal adjustment/austerity in reducing public debt and, particularly, their growth consequences, (which are the subject of some considerable debate) is beyond the scope of this paper. The incidence of explicit default or debt restructuring (or forcible debt conversions) among advanced economies (through and including World War II episodes) and emerging markets as well as hyperinflation as debt-reduction mechanisms is analyzed in Reinhart and Rogoff (2009 and 2011).

The aim of this paper is to document the more subtle and gradual form of debt restructuring or "taxation" that has ocurred via financial repression (as defined in Box 1). We show that such repression helped reduce lofty mountains of public debt in many of the advanced economies in the decades following World War II and subsequently in emerging markets, where financial liberalization is of more recent vintage.[5] We find that

[3] For instance, in analyzing *external* debt reduction episodes in emerging markets, Reinhart, Rogoff, and Savastano (2003) suggest that default and debt/restructuring played a leading role in most of the episodes they identify. However, in numerous cases the debt restructurings (often under the umbrella of IMF programs) were accompanied by debt repayments associated with some degree of fiscal adjustment.
[4] See Checherita and Rother (2010), Kumar and Woo (2010), and Reinhart and Rogoff (2010).
[5] In a recent paper, Aizenman and Marion (2010) stress the important role played by inflation in reducing U.S. World War II debts and develop a framework to highlight how the government may be tempted to

financial repression in combination with inflation played an important role in reducing debts. Inflation need not take market participants entirely by surprise and, in effect, it need not be very high (by historic standards). In effect, financial repression via controlled interest rates, directed credit and persistent, positive inflation rates is still an effective way of reducing domestic government debts in the world's second largest economy--China.[6]

Prior to the 2007 crisis, it was deemed unlikely that advanced economies could experience financial meltdowns of a severity to match those of the pre-World War II era; the prospect of a sovereign default in wealthy economies was similarly unthinkable.[7] Repeating that pattern, the ongoing discussion of how public debts have been reduced in the past has focused on the role played by fiscal adjustment. It thus appears that it has also been collectively "forgotten" that the widespread system of financial repression that prevailed for several decades (1945-1980s) worldwide played an instrumental role in reducing or "liquidating" the massive stocks of debt accumulated during World War II in many of the advanced countries, United States inclusive. [8] We document this phenomenon.

The next section discusses how previous "debt-overhang" episodes have been resolved since 1900. There is a brief sketch of the numerous defaults, restructurings,

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follow that route in the near future. However, the critical role played by financial repression (regulation) in keeping nominal interest rates low and producing negative real interest rates was not part of their analysis.

[6] Bai et. al. (1999), for example, present a framework that provides a general rationale for financial repression as an implicit taxation of savings. They argue that when effective income-tax rates are very uneven, as common in developing countries, raising some government revenue through mild financial repression can be more efficient than collecting income tax only.

[7] The literature and public discussion surrounding "the great moderation" attests to this benign view of the state of the macroeconomy in the advanced economies. See, for example, McConnell and Perez-Quiros (2000).

[8] For the political economy of this point see the analysis presented in Alesina, Grilli, and Milesi Ferretti (1993). They present a framework and stylized evidence to support it that strong governments coupled with weak central banks may impose capital controls so as to enable them to raise more seigniorage and keep interest rates artificially low—facilitating domestic debt reduction..

conversions (forcible and "voluntary") that dealt with the debts of World War I and the Great Depression. This narrative, which follows Reinhart and Rogoff (2009 and 2011), primarily serves to highlight the substantially different route taken after World War II to deal with the legacy of high war debts.

Section III provides a short description of the types of financial sector policies that facilitated the liquidation of public debt. Hence, our analysis focuses importantly on regulations affecting interest rates (with the explicit intent on keeping these low) and on policies creating "captive" domestic audiences that would hold public debts (in part achieved through capital controls, directed lending, and an enhanced role for nomarketable public debts).

We also focus on the evolution of real interest rates during the era of financial repression (1945-1980s). We show that real interest rates were significantly lower during 1945-1980 than in the freer capital markets before World War II and after financial liberalization. This is the case irrespective of the interest rate used--whether central bank discount, treasury bills, deposit, or lending rates and whether for advanced or emerging markets. For the advanced economies, real ex-post interest rates were negative in about half of the years of the financial repression era compared to less than 15 percent of time since the early 1980s.

In Section IV, we provide a basic conceptual framework for calculating the "financial repression tax," or more specifically, the annual *"liquidation rate*" of government debt. Alternative measures are also discussed. These exercises use a detailed data base on a country's public debt profile (coupon rates, maturities, composition, etc.) from 1945 to 1980 constructed by Sbrancia (2011). This "synthetic" public debt portfolio reflects the actual shares of debts across the different spectrum of maturities as well as

the shares of marketable versus nonmarketable debt (the latter involving both securitized debt as well as direct bank loans).

Section V presents the central findings of the paper, which are estimates of the annual *"liquidation tax"* as well as the incidence of *liquidation* years for ten countries (Argentina, Australia, Belgium, India, Ireland, Italy, South Africa, Sweden, the United Kingdom, and the United States). For the United States and the United Kingdom, the annual liquidation of debt via negative real interest rates amounted to 3 to 4 percent of GDP on average per year. Such annual deficit reduction quickly accumulates (even without any compounding) to a 30-40 percent of GDP debt reduction in the course of a decade. For other countries, which recorded higher inflation rates the liquidation effect was even larger. As to the incidence of liquidation years, Argentina sets the record with negative real rates recorded every single year from 1945 to 1980.

Section VI examines the question of whether inflation rates were systematically higher during periods of debt reduction in the context of a broader 28-country sample that spans both the heyday of financial repression as well as the periods before and after. We describe the algorithm used to identify the largest debt reduction episodes on a country-by-country basis and, show that in 21 of the 28 countries inflation was higher during the larger debt reduction periods.

Finally, we discuss some of the implications of our analysis for the current debt overhang and highlight areas for further research. There are detailed appendices which: (i) compare our methodology to other approaches in the literature that have been used to measure the extent of financial repression or calculate the financial repression tax; (ii) provide country-specific details on the behavior of real interest rates across regimes; and (iii) describe the coverage and extensive sources for the data compiled for this study.

Box 1: Financial Repression Defined

The pillars of "Financial repression"

The term financial repression was introduced in the literature by the works of Shaw (1973) and Ronald McKinnon (1973). Subsequently, the term became a way of describing emerging market financial systems prior to the widespread financial liberalization that began in the 1980 (see Agenor and Montiel, 2008, for an excellent discussion of the role of inflation and Giovannini and de Melo, 1993 and Easterly, 1989 for country-specific estimates). However, as we document in this paper, financial repression was also the norm for advanced economies during the post World War II and in varying degrees up through the 1980s. We describe here some of its main features.

(i) Explicit or indirect **caps or ceilings on interest rates**, particularly (but not exclusively) those on government debts. These interest rate ceilings could be effected through various means including: *(a)* explicit government regulation (for instance, Regulation Q in the United States prohibited banks from paying interest on demand deposits and capped interest rates on saving deposits). *(b)* In many cases ceilings on banks' lending rates were a direct subsidy to the government in cases where the government borrowed directly from the banks (via loans rather than securitized debt); *(c)* the interest rate cap could be in the context of fixed coupon rate nonmarketable debt; *(d)* or it could be maintained through central bank interest rate targets (often at the directive of the Treasury or Ministry of Finance when central bank independence was limited or nonexistent). Metzler's (2003) monumental history of the Federal Reserve (Volume I) documents the US experience in this regard; Cukierman's (1992) classic on central bank independence provides a broader international context.

(ii) **Creation and maintenance of a captive domestic audience** that facilitated directed credit to the government. This was achieved through multiple layers of regulations from very blunt to more subtle measures. *(a)* Capital account restrictions and exchange controls orchestrated a "forced home bias" in the portfolio of financial institutions and individuals under the Bretton Woods arrangements. *(b)* High reserve requirements (usually non-remunerated) as a tax levy on banks (see Brock, 1989, for an insightful international comparison). *(c)* Among more subtle measures, "prudential" regulatory measures requiring that institutions (almost exclusively domestic ones) hold government debts in their portfolios (pension funds have historically been a primary target); and *(d)* transaction taxes on equities (see Campbell and Froot, 1994) also act to direct investors toward government (and other) types of debt instruments. *(e)* prohibitions on gold transactions.

(iii) Other common measures associated with financial repression aside from the ones discussed above are, direct ownership (China or India) of banks or extensive management of banks and other financial institutions (i.e. Japan). Restrictions of entry to the financial industry and directing credit to certain industries are also features of repressed financial markets (see Beim and Calomiris, 2000).

II. Default, Restructuring and Conversions: Highlights from 1920s-1950s

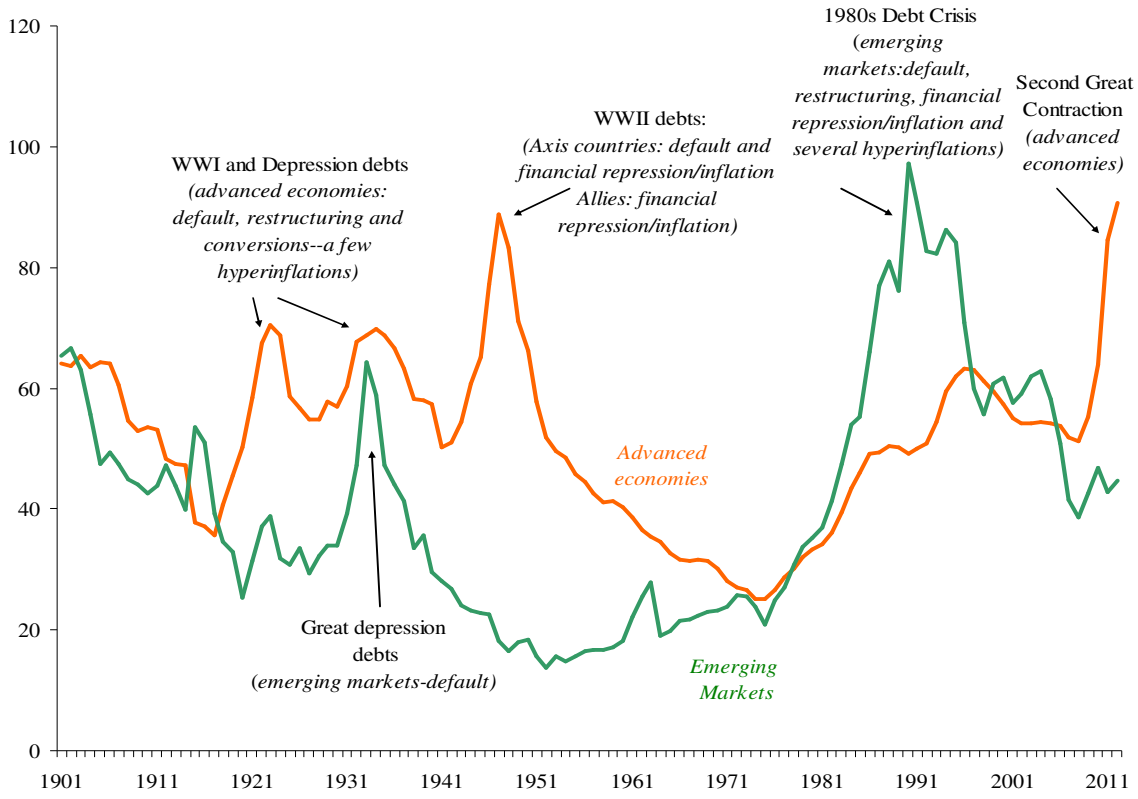
Peaks and troughs in public debt/GDP are seldom synchronized across many countries' historical paths. There are, however, a few historical episodes where global (or nearly global) developments, be it a war or a severe financial and economic crisis, produces a synchronized surge in public debt, such as the one recorded for advanced economies since 2008. Using the Reinhart and Rogoff (2011) database for 70 countries, Figure 1 provides central government debt/GDP for the advanced economy and emerging market subgroups since 1900. It is a simple arithmetic average that does not assign weight according to country size.

1. Global debt surges and their resolution

An examination of these two series identifies a total of five peaks in world indebtedness. Three episodes (World War I, World War II, and the Second Great Contraction, 2008-present) are almost exclusively advanced economy debt peaks; one is unique to emerging markets (1980s debt crisis followed by the transition economies' collapses); and the Great Depression of the 1930s is common to both groups. World War I and Depression debts were importantly resolved by widespread default and explicit restructurings or predominantly forcible conversions of domestic and external debts in both the now-advanced economies, as well as the emerging markets. Notorious hyperinflations in Germany, Hungary and other parts of Europe violently liquidated domestic-currency debts. Table 1 and the associated discussion provide a chronology of these debt resolution episodes. As Reinhart and Rogoff (2009 and 2011) document, debt reduction via default or restructuring has historically been associated with substantial

declines in output in the run-up to as well as during the credit event and in its immediate aftermath.

Figure 1. Surges in Central Government Public Debts and their Resolution: Advanced Economies and Emerging Markets, 1900-2011



Sources: Reinhart (2010), Reinhart and Rogoff (2009 and 2011), sources cited therein and the authors.
Notes: Listed in parentheses below each debt-surge episode are the main mechanisms for debt resolution besides fiscal austerity programs which were not implemented in any discernible synchronous pattern across countries in any given episode. Specific default/restructuring years by country are provided in the Reinhart-Rogoff database and a richer level of detail for 1920s-1950s (including various conversions are listed in Table 1). The "typical" forms of financial repression measures are discussed in Box 1 and greater detail for the core countries are provided in Table 2.

The World War II debt overhang was importantly liquidated via the combination of financial repression and inflation, as we shall document. This was possible because debts were predominantly domestic and denominated in domestic currencies. The robust post-war growth also contributed importantly to debt reduction in a way that was a marked contrast to the 1930s, during which the combined effects of deflation and output

collapses worked worsen the debt/GDP balance in the way stressed by Irving Fisher (1931).

The resolution of the emerging market debt crisis involved a combination of default or restructuring of external debts, explicit default or financial repression on domestic debt. In several episodes, notably in Latin America, hyperinflations in the mid-to-late 1980s and early 1990s completed the job of significantly liquidating (at least for a brief interlude) the remaining stock of domestic currency debt (even when such debts were indexed, as was the case of Brazil). [9]

2. Default, restructurings and forcible conversions in the 1930s

Table 1 lists the known "domestic credit events" of the Depression. Default on or restructuring of external debt (see the extensive notes to the table) also often accompanied the restructuring or default of the domestic debt. All the Allied governments, with the exception of Finland, defaulted on (and remained in default through 1939 and never repaid) their World War I debts to the United States as economic conditions deteriorated worldwide during the 1930s.[10]

Thus, the high debts of the First World War and the subsequent debts associated with the Depression of the 1930s were resolved ***primarily*** through default and restructuring. Neither economic growth nor inflation contributed much. In effect, for all 21 now-advanced economies, the median annual inflation rate for 1930-1939 was barely

[9] Backward-looking indexation schemes are not particularly effective in hyperinflationary conditions.
[10] Finland, being under threat of Soviet invasion at the time, maintained payments on their debts to the United States so as to maintain the best possible relationship.

above zero (0.4 percent). [11] Real interest rates remained high through significant stretches of the decade.

It is important to stress that during the period after WWI the gold standard was still in place in many countries, which meant that monetary policy was subordinated to keep a given gold parity. In those cases, inflation was not a policy variable available to policymakers in the same way that it was after the adoption of fiat currencies.

[11] See Reinhart and Reinhart (2010).

Table 1. Episodes of Domestic Debt Conversions, Default or Restructuring,1920s–1950s

Country	Dates	Commentary
For additional possible domestic defaults in several European countries during the 1930s, see notes below.		
Australia	1931/1932	The Debt Conversion Agreement Act in 1931/32 which appears to have done something similar to the later NZ induced conversion. See New Zealand entry. [1]
Bolivia	1927	Arrears of interest lasted until at least 1940.
Canada (Alberta)	April 1935	The only province to default—which lasted for about 10 years.
China	1932	First of several "consolidations", monthly cost of domestic service was cut in half. Interest rates were reduced to 6 percent (from over 9 percent)—amortization periods were about doubled in length.
France	1932	Various redeemable bonds with coupons between 5 and 7 percent, converted into a 4.5 percent bond with maturity in 75 years.
Greece	1932	Interest on domestic debt was reduced by 75 percent since 1932; Domestic debt was about 1/4 of total public debt.
Italy	November 6th, 1926	Issuance of Littorio. There were 20.4 billion lire subject to conversion, of which 15.2 were "Buoni Ordinari"[12]
Italy	February 3rd, 1934	5 percent Littorio (see entry above) converted into 3.5 percent Redimibile
Mexico	1930s	Service on external debt was suspended in 1928. During the 1930s, interest payments included "arrears of expenditure and civil and military pensions."
New Zealand	1933	In March 1933 the New Zealand Debt Conversion Act was passed providing for voluntary conversion of internal debt amounting to 113 million pounds to a basis of 4 per cent for ordinary debt and 3 per cent for tax-free debt. Holders had the option of dissenting but interest in the dissented portion was made subject to an interest tax of 33.3 per cent. [1]
Peru	1931	After suspending service on external debt on May 29, Peru made "partial interest payments" on domestic debt.
Romania	February 1933	Redemption of domestic and foreign debt is suspended (except for three loans).
Spain	October 1936–April 1939	Interest payments on external debt were suspended, arrears on domestic debt service.
United States	1933	Abrogation of the gold clause. In effect, the U.S. refused to pay Panama the annuity in gold due to Panama according to a 1903 treaty. The dispute was settled in 1936 when the US paid the agreed amount in gold *balboas*.
United Kingdom	1932	Most of the outstanding WWI debt was consolidated into a 3.5 percent perpetual annuity. This domestic debt conversion was apparently voluntary. However, some of the WWI debts to the United States were issued under domestic (UK) law (and therefore classified as domestic debt) and these

[12] These are bonds with maturity between 3 and 12 month issued at discount.

		were defaulted on following the end of the Hoover 1931 moratorium.
Uruguay	November 1, 1932–February, 1937	After suspending redemption of external debt on January 20, redemptions on domestic debt were equally suspended.
Austria	December 1945	Restoration of schilling (150 limit per person). Remainder placed in blocked accounts. In December 1947, large amounts of previously blocked schillings invalidated and rendered worthless. Temporary blockage of 50 percent of deposits.
Germany	June 20, 1948	Monetary reform limiting 40 Deutschemark per person. Partial cancellation and blocking of all accounts.
Japan	March 2, 1946–1952	After inflation, exchange of all bank notes for new issue (1 to 1) limited to 100 yen per person. Remaining balances were deposited in blocked accounts.
Russia	1947	The monetary reform subjected privately held currency to a 90 percent reduction.
	April 10, 1957	Repudiation of domestic debt (about 253 billion rubles at the time).

Sources: Reinhart and Rogoff (2011) and the authors.

[1] See Schedvin (1970) and Prichard (1970), for accounts of the Australian and New Zealand conversions, respectively, during the Depression. Michael Reddell kindly alerted us to these episodes and references. Alex Pollock pointed out the relevance of widespread restrictions on gold holdings in the United States and elsewhere during the financial repression era.

Notes: We have made significant further progress in sorting out the defaults on World War I debts to the United States, notably by European countries. In all cases these episodes are classified as a default on external debts. However, in some case –such as the UK--some of the WWI debts to the US were also issued under the domestic law and, as such, would also qualify as a domestic default. The external defaults on June 15, 1934 included: Austria, Belgium, Czechoslovakia, Estonia, France, Greece, Hungary, Italy, Latvia, Poland, United Kingdom. Only Finland made payments. See *New York Times,* June 15, 1934.

III. Financial Repression: policies and evidence from real interest rates

1. Selected financial regulation measures during the "era of financial repression"

One salient characteristic of financial repression is its pervasive lack of transparency. The reams of regulations applying to domestic and cross-border financial transactions and directives cannot be summarized by a brief description. Table 2 makes this clear by providing a broad sense of the kinds of regulations on interest rates and cross-border and foreign exchange transactions and how long these lasted since the end of the war in 1945. A common element across countries "financial architecture" not brought out in Table 2 is

that domestic government debt played a dominant role in domestic institutions asset holdings--notably that of pension funds. High reserve requirements, relative to the current practice in advanced economies and many emerging markets, were also a common way of taxing the banks not captured in our minimalist description. The interested reader is referred to Brock (1989) and Agenor and Montiel (2008), who focus on the role of reserve requirements and their link to inflation (see also Appendix Table A.1.2 and accompanying discussion.)

Table 2: Selected Measures Associated with Financial Repression

Country	Domestic Financial Regulation Liberalization years (s) in *italics* with emphasis on deregulation of interest rates.	Capital Account-Exchange Restrictions Liberalization years (s) in *italics*
Argentina	*1977-82, 1987, and 1991-2001,* Initial liberalization in 1977 was reversed in 1982. Alfonsin government undertook steps to deregulate the financial sector in October 1987, some interest rates being freed at that time. The Convertibility Plan -March 1991-2001, subsequently reversed.	*1977-82 and 1991-2001*. Between 1976 and 1978 multiple rate system was unified, foreign loans were permitted at market exchange rates, and all forex transactions were permitted up to US$ 20,000 by September 1978. Controls on inflows and outflows loosened over 1977-82. Liberalization measures were reversed in 1982. Capital and exchange controls eliminated in 1991 and reinstated on December 2001.
Australia	*1980,* Deposit rate controls lifted in 1980. Most loan rate ceilings abolished in 1985. A deposit subsidy program for savings banks started in 1986 and ended in 1987.	*1983*, capital and exchange controls tightened in the late 1970's, after the move to indirect monetary policy increased capital inflows. Capital account liberalized in 1983.
Brazil	*1976-79 and 1989 onwards,* interest rate ceilings removed in 1976, but reimposed in 1979. Deposit rates fully liberalized in 1989. Some loan rates freed in 1988. Priority sectors continue to borrow at subsidized rates. Separate regulation on interest rate ceilings exists for the microfinance sector	*1984*, System of comprehensive foreign exchange controls abolished in 1984. In the 1980's most controls restricted outflows. In the 1990's controls on inflows were strengthened and those on outflows loosened and (once again) in 2010.
Canada	*1967,* with the revision of the Bank Act in 1967, interest rates ceilings were abolished. Further liberalizing measures were adopted in 1980 (allowing foreign banks entry into the Canadian market) and 1986.	*1970,* mostly liberal regime.
Chile	*1974 but deepens after 1984,* commercial bank rates liberalized in 1974. Some controls reimposed in 1982. Deposit rates fully market determined since 1985. Most loan rates are market determined since 1984.	*1979,* capital controls gradually eased since 1979. Foreign portfolio and direct investment is subject to a one year minimum holding period. During the 1990s, foreign borrowing is subject to a 30% reserve requirement.
Colombia	*1980,* most deposit rates at commercial banks are market determined since 1980; all after 1990. Loan rates at commercial banks are market determined since the mid-70's. Remaining controls lifted by 1994 in all but a few sectors. Some usury ceilings remain.	*1991,* capital transactions liberalized in 1991. Exchange controls were also reduced. Large capital inflows in the early 90's led to the reimposition of reserve requirements on foreign loans in 1993.

Egypt	*1991,* interest rates liberalized. Heavy "moral suasion" on banks remains.	*1991*, Decontrol and unification of the foreign exchange system. Portfolio and direct investment controls partially lifted in the 90's.
Finland	*1982,* gradual liberalization 1982-91. Average lending rate permitted to fluctuate within limits around the Bank of Finland base rate or the average deposit rate in 1986. Later in the year regulations on lending rates abolished. In 1987, credit guidelines discontinued, the Bank of Finland began open market operations in bank CD's and HELIBOR market rates were introduced. In 1988, floating rates allowed on all loans.	*1982.*Gradual liberalization 1982-91. Foreign banks allowed to establish subsidiaries in 1982. In 1984, domestic banks allowed to lend abroad and invest in foreign securities. In 1987, restrictions on long-term foreign borrowing on corporations lifted. In 1989, remaining regulations on foreign currency loans were abolished, except for households. Short-term capital movements liberalized in 1991. In the same year, households were allowed to raise foreign currency denominated loans.
France	*1984,* interest rates (except on subsidized loans) freed in 1984. Subsidized loans now available to all banks, are subject to uniform interest ceiling.	*1986*, in the wake of the dollar crisis controls on in/outflows tightened. The extensive control system established by 1974, remains in place to early 80's. Some restrictions lifted in 1983-85. Inflows were largely liberalized over 1986-88. Liberalization completed in 1990.
Germany	*1980*, interest rates freely market determined from the 70's to today. In the year indicated, further liberalizations were undertaken.	*1974.* Mostly liberal regime in the late 60's, Germany experiments with controls between 1970-73. Starting 1974, controls gradually lifted, and largely eliminated by 1981.
India	*1992.* Complex system of regulated interest rates simplified in 1992. Interest rate controls on D's and commercial paper eliminated in 1993 and the gold market is liberalized. The minimum lending rate on credit over 200,000 Rs eliminated in 1994. Interest rates on term deposits of over two years liberalized in 1995.	*1991.* Regulations on portfolio and direct investment flows eased in 1991. The exchange rate was unified in 1993/94. Outflows remained restricted, and controls remained on private off-shore borrowing.
Italy	*1983.* Maximum rates on deposits and minimum rates on loans set by Italian Banker's Association until 1974. Floor prices on government bonds eliminated in 1992.	*1985.* Continuous operation of exchange controls in the 70's. Fragile BoP delays opening in early 80's. Starting in 1985, restrictions are gradually lifted. All remaining foreign exchange and capital controls eliminated by May 1990.
Japan	*1979.* Interest rate deregulation started in 1979. Gradual decontrol of rates as money markets grow and deepen after 85. Interest rates on most fixed-term deposits eliminates by 1993. Non time deposits rates freed in 1994. Lending rates market determined in the 90's (though they started in 1979, both external and domestic liberalizations were very gradual and cautious).	*1979.* Controls on inflows eased after 1979. Controls on outflows eased in the mid-80s. Forex restrictions eased in 1980. Remaining restrictions on cross border transactions removed in 1995.

Korea	*1991.* Liberalizing measures adopted in the early 80's aimed at privatization and greater managerial leeway to commercial banks. Significant interest rate liberalization in four phases. Significant interest rate liberalization in four phases in the 90's: 1991, 1993-94 and 1997. Most interest rate deregulated by 1995, except demand deposits and government supported lending.	*1991.* Current account gradually liberalized between 1985-87, and article VIII accepted in 1988. Capital account gradually liberalized, starting in 1991, usually following domestic liberalization. Restrictions on FDI and portfolio investment loosened in the early 90's. Beginning with outflows, inflows to security markets allowed cautiously only in the mid 90's. Complete liberalization planned for 2000.
Malaysia	*1978-1985 and 1987 onwards.* Initially liberalized in 1978. Controls were reimposed in the mid-80's (especially 1985-87) and abandoned in 1991.	*1987.* Measures for freer in/outflows of funds taken in 1973. Further ease of controls in 1987. Some capital controls reimposed in 1994. Liberalization of the capital account was more modest, and followed that of the current account.
Mexico	*1977, deepens after 1988.*Time deposits with flexible interest rates below a ceiling permitted in 1977. Deposit rates liberalized in 1988-89. Loan rates have been liberalized since 1988-89 except at development banks.	*1985.* Historically exchange regime much less restrictive than trade regime. Further gradual easing between mid-1985 to 1991. 1972 Law gave government discretion over the sectors in which foreign direct investment was permitted. Ambiguous restrictions on fdi rationalized in 1989. Portfolio flows were further decontrolled in 1989.
New Zealand	*1984.* Interest rate ceilings removed in 1976 and reimposed in 1981. All interest rate controls removed in the summer of 1984.	*1984.* All controls on inward and outward Forex transactions removed in 1984. Controls on outward investment lifted in 1984. Restrictions on foreign companies' access to domestic financial markets removed in 1984.
Philippines	*1981.* Interest rate controls mostly phased out between 1981-85. Some controls reintroduced during the financial crisis of 1981-87. Cartel-like interest rate fixing remains prevalent.	*1981.* Foreign exchange and investment controlled by the government in the 70's. After the 1983 debt crisis the peso was floated but with very limited interbank forex trading. Off-floor trading introduced in 1992. Between 1992-95 restrictions on all current and most capital account transactions were eliminated. Outward investment limited to $6 mill/person/year
South Africa	*1980.* Interest rate controls removed in 1980. South Africa Reserve Bank relies entirely on indirect instruments. Primary, Secondary and Interbank markets active and highly developed. Stock Exchange modern with high volume of transactions.	*1983.* Partially liberalized regime. Exchange controls on non-residents abolished in 1983. Limits still apply on purchases of forex for capital and current transactions by residents. Inward investment unrestricted, outward is subject to approval if outside Common Monetary Area. Several types of financial transactions subject to approval for monitoring and prudential purposes.

Sweden	*1980.* Gradual liberalization in the early 80's. Ceilings on deposit rates abolished in 1978. In 1980, controls on lending rates for insurance companies were removed, as well as a tax on bank issues of certificate of deposits. Ceilings on bank loan rates were removed in 1985.	*1980.* Gradual liberalization between 1980-90. Foreigners allowed to hold Swedish shares in 1980. Forex controls on stock transactions relaxed in 1986-88, and residents allowed to buy foreign shares in 1988-89. In 1989 foreigners were allowed to buy interest bearing assets and remaining forex controls were removed. Foreign banks were allowed subsidiaries in 1986, and operation through branch offices in 1990.
Thailand	*1989.* Removal of ceilings on interest rates begins in 1989. Ceiling on all time deposits abolished by 1990. Ceilings on saving deposits rates lifted in 1992. Ceilings on finance companies borrowing and lending rates abolished in 1992.	*1991.* Liberalized capital movements and exchange restrictions in successive waves between 1982-92. Article VIII accepted and current account liberalization in 1990, capital account liberalization starting in 1991. Aggressive policy to attract inflows, but outflows freed more gradually. Restrictions on export of capital remain. The reserve requirement on short-term foreign borrowing in 7%. Currency controls introduced in May-June 1997. These controls restricted foreign access to baht in domestic markets and from the sale of Thai equities. Thailand relaxed limits on foreign ownership of domestic financial institutions in October of 1997.
Turkey	*1980-82 and 1987 onwards.* Liberalization initiated in 1980 but reversed by 1982. Interest rates partially deregulated again in 1987, when banks were allowed to fix rates subject to ceilings determined by the Central Bank. Ceilings were later removed and deposit rates effectively deregulated. Gold market liberalized in 1993.	*1989.* Partial external liberalization in the early 80's, when restrictions on inflows and outflows are maintained except for a limited set of agents whose transactions are still subject to controls. Restrictions on capital movements finally lifted after August 1989.
United Kingdom	*1981.* The gold market, closed in early World War II, reopened only in 1954. The Bank of England stopped publishing the Minimum Lending Rate in 1981. In 1986, the government withdrew its guidance on mortgage lending.	*1979.* July 79: all restrictions on outward FDI abolished, and outward portfolio investment liberalized. Oct 1979: Exchange Control Act of 1947 suspended, and all remaining barriers to inward and outward flows of capital removed.
United States	*1982.* 1951-Treasury accord/debt conversion swapped marketable short term debt for nonmarketable 29-year bond. Regulation Q suspended and S&Ls deregulated in 1982. In 1933, President Franklin D. Roosevelt prohibits private holdings of all gold coins, bullion, and certificates. On December 31, 1974, Americans are permitted to own gold, other than just jewelry.	*1974.* In 1961 Americans are forbidden to own gold abroad as well as at home. A broad array of controls were abolished in 1974.

Venezuela	*1991-94 and 1996 onwards.* Interest rate ceilings removed in 1991, reimposed in 1994, and removed again in 1996. Some interest rate ceilings apply only to institutions and individuals not regulated by banking authorities (including NGOs).	*1989-94 and 1996 onwards.* FDI regime largely liberalized over 1989-90. Exchange controls on current and capital transactions imposed in 1994. The system of comprehensive forex controls was abandoned in April 1996. Controls are reintroduced in 2003.

Sources: Reinhart and Reinhart (2011) and sources cited therein. See also FOMC minutes, March 1-2, 1951 for US debt conversion particulars, http://www.microfinancegateway.org/p/site/m/template.rc/1.26.9055/ on current ceilings and related practices applied to microfinance, and National Mining Association (2006) on measures pertaining to gold.

2. Real Interest Rates

One of the main goals of financial repression is to keep nominal interest rates lower than would otherwise prevail. This effect, other things equal, reduces the governments' interest expenses for a given stock of debt and contributes to deficit reduction. However, when financial repression produces negative real interest rates, this also reduces or liquidates existing debts. It is a transfer from creditors (savers) to borrowers (in the historical episode under study here--the government).

The financial repression tax has some interesting political-economy properties. Unlike income, consumption, or sales taxes, the "repression" tax rate (or rates) are determined by financial regulations and inflation performance that are opaque to the highly politicized realm of fiscal measures. Given that deficit reduction usually involves highly unpopular expenditure reductions and (or) tax increases of one form or another, the relatively "stealthier" financial repression tax may be a more politically palatable alternative to authorities faced with the need to reduce outstanding debts. As discussed in Obstfeld and Taylor (2004) and others, liberal capital- market regulations (the accompanying market-determined interest rates) and international capital mobility reached their heyday prior to World War I under the umbrella of the gold standard. World War I and the suspension of convertibility and international gold shipments it brought, and, more generally, a variety of restrictions on cross border transactions were the first blows to the globalization of capital. Global capital markets recovered partially during the roaring twenties, but the Great Depression, followed by World War II, put the final nails in the coffin of laissez faire banking. It was in this environment that the Bretton Woods arrangement of fixed exchange rates and tightly controlled domestic and

international capital markets was conceived. [13] In that context, and taking into account the major economic dislocations, scarcities, etc. which prevailed at the closure of the second great war, we witness a combination of very low nominal interest rates and inflationary spurts of varying degrees across the advanced economies. The obvious result, were real interest rates--whether on treasury bills (Figure 2), central bank discount rates (Figure 3), deposits (Figure 4) or loans (not shown)—that were markedly negative during 1945-1946.

For the next 35 years or so, real interest rates in both advanced and emerging economies would remain consistently lower than the eras of freer capital mobility before and after the financial repression era. In effect, real interest rates (Figures 2-4) were, on average negative.[14] Binding interest rate ceilings on deposits (which kept real ex-post deposit *rates even more negative* than real ex-post rates on treasury bills, as shown in Figures 2 and 4) "induced" domestic savers to hold government bonds. What delayed the emergence of leakages in the search for higher yields (apart from prevailing capital controls) was that the incidence of negative returns on government bonds and on deposits was (more or less) a universal phenomenon at this time[15]. The frequency distributions of real rates for the period of financial repression (1945-1980) and the years following financial liberalization (roughly 1981-2009 for the advanced economies) shown in the three panels of Figure 5, highlight the universality of lower real interest rates prior to the 1980s and the high incidence of negative real interest rates.

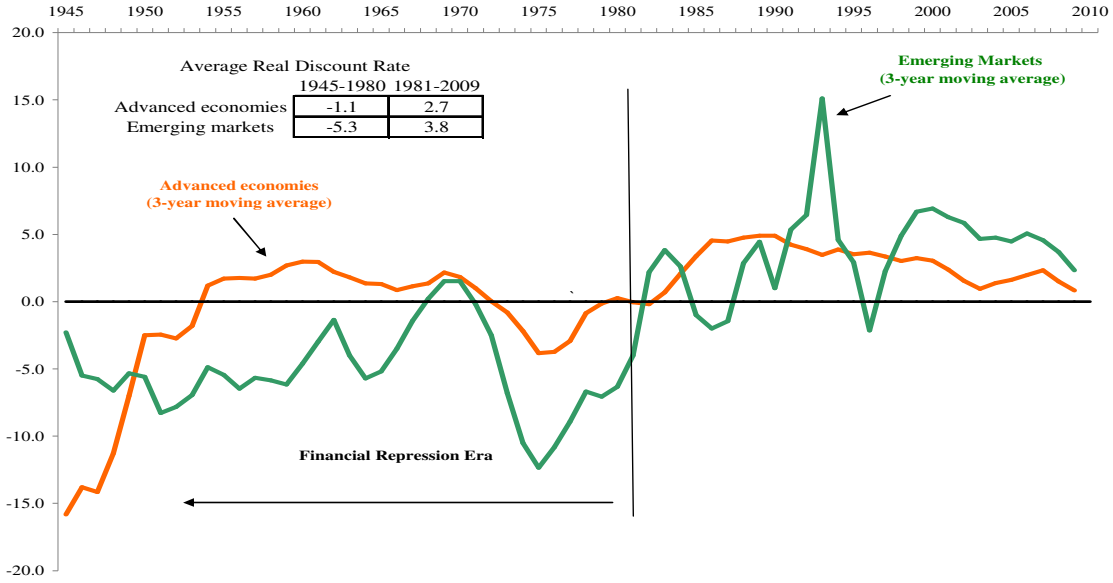
[13] In a framework where there are both tax collection costs and a large stock of domestic government, Aizenman and Guidotti, (1994) show how a government can resort to capital controls (which lower domestic interest rates relative to foreign interest rates) to reduce the costs of servicing the domestic debt.
[14] Note that real interest rates were lower in a high-economic-growth period of 1945 to 1980 than in the lower growth period 1981-2009; this is exactly the opposite of the prediction of a basic growth model and therefore indicative of significant impediments to financial trade.
[15] A comparison of the return on government bonds to that of equity during this period and its connection to "the equity premium puzzle" can be found in Sbrancia (2011).

Such negative (or low) real interest rates were consistently and substantially below the real rate of growth of GDP, this is consistent with the observation of Elmendorf and Mankiw (1999) when they state *"An important factor behind the dramatic drop (in US public debt) between 1945 and 1975 is that the growth rate of GNP exceeded the interest rate on government debt for most of that period."* They fail to explain why this configuration should persist over three decades in so many countries.

Figure 2: Average Ex-post Real Rate on Treasury Bills: Advanced Economies and Emerging Markets, 1945-2009 (3-year moving averages, in percent)

Sources: *International Financial Statistics,* International Monetary Fund, various sources listed in the Data Appendix, and authors' calculations.
Notes: The advanced economy aggregate is comprised of: Australia, Belgium, Canada, Finland, France, Germany, Greece, Ireland, Italy, Japan, New Zealand, Sweden, the United States, and the United Kingdom. The emerging market group consists of: Argentina, Brazil, Chile, Colombia, Egypt, India, Korea, Malaysia, Mexico, Philippines, South Africa, Turkey and Venezuela. The average is unweighted and the country coverage is somewhat spotty prior for emerging markets to 1960, as detailed in the Data Appendix.

Figure 3: Average Ex-post Real Discount Rate: Advanced Economies and Emerging Markets, 1945-2009 (3-year moving averages, in percent)



Sources: *International Financial Statistics,* International Monetary Fund, various sources listed in the Data Appendix, and authors' calculations.
Notes: The advanced economy aggregate is comprised of: Australia, Belgium, Canada, Finland, France, Germany, Greece, Ireland, Italy, Japan, New Zealand, Sweden, the United States, and the United Kingdom. The emerging market group consists of: Argentina, Brazil, Chile, Colombia, Egypt, India, Korea, Malaysia, Mexico, Philippines, South Africa, Turkey and Venezuela. The average is unweighted and the country coverage is somewhat spotty prior for emerging markets to 1960, as detailed in the Data Appendix.

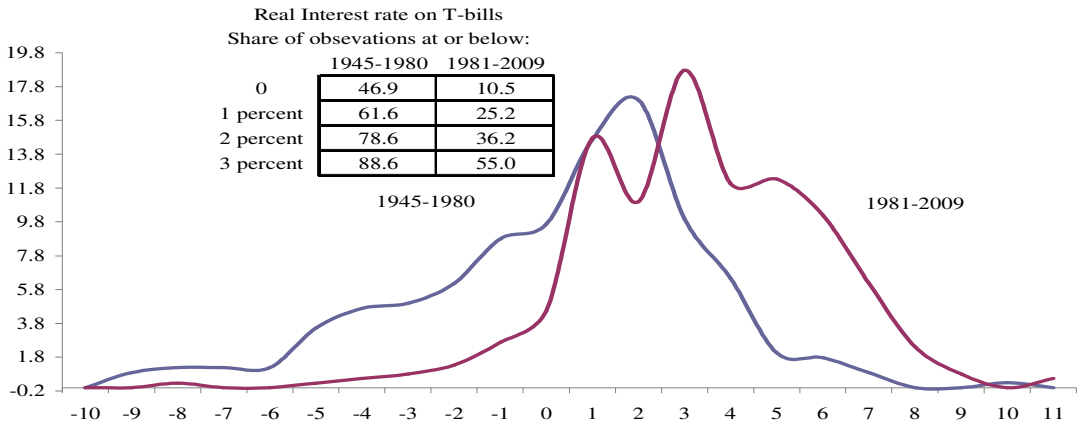
Figure 4: Average Ex-post Real Interest Rates on Deposits: Advanced Economies and Emerging Markets, 1945-2009 (3-year moving averages, in percent)

Sources: *International Financial Statistics,* International Monetary Fund, various sources listed in the Data Appendix, and authors' calculations.
Notes: The advanced economy aggregate is comprised of: Australia, Belgium, Canada, Finland, France, Germany, Greece, Ireland, Italy, Japan, New Zealand, Sweden, the United States, and the United Kingdom. The emerging market group consists of: Argentina, Brazil, Chile, Colombia, Egypt, India, Korea, Malaysia, Mexico, Philippines, South Africa, Turkey and Venezuela. The average is unweighted and the country coverage is spotty prior to 1960, as detailed in the Data Appendix.

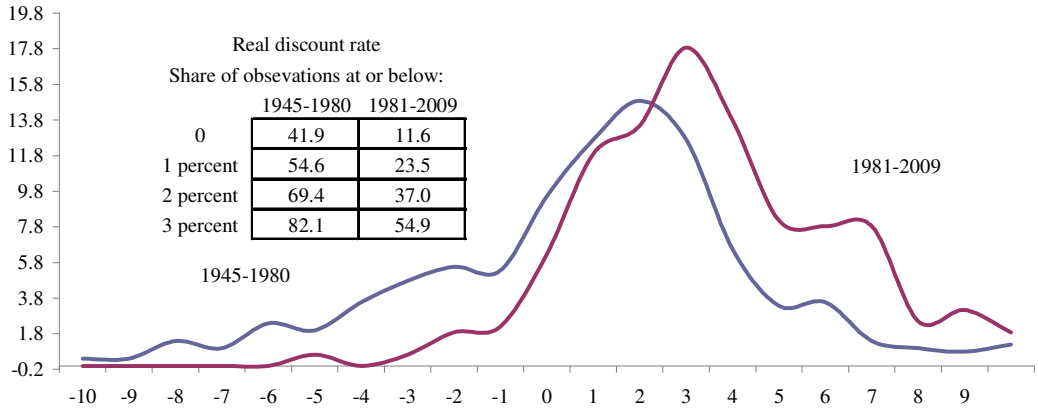
Real interest rates on deposits were negative in about 60 percent of the observations. In effect, real ex-post deposit rates were below one percent about 83 percent of the time. Appendix Table A1.1, which shows for each country average real interest rates during the financial repression period (the dates vary, as highlighted in Table 2, depending when interest rates were liberalized) and thereafter substantiate our claims that low and negative real interest rates (by historical standards) were the norm across countries with very different levels of economic development.

Figure 5: Real Interest Rates Frequency Distributions: Advanced Economies, 1945-2009

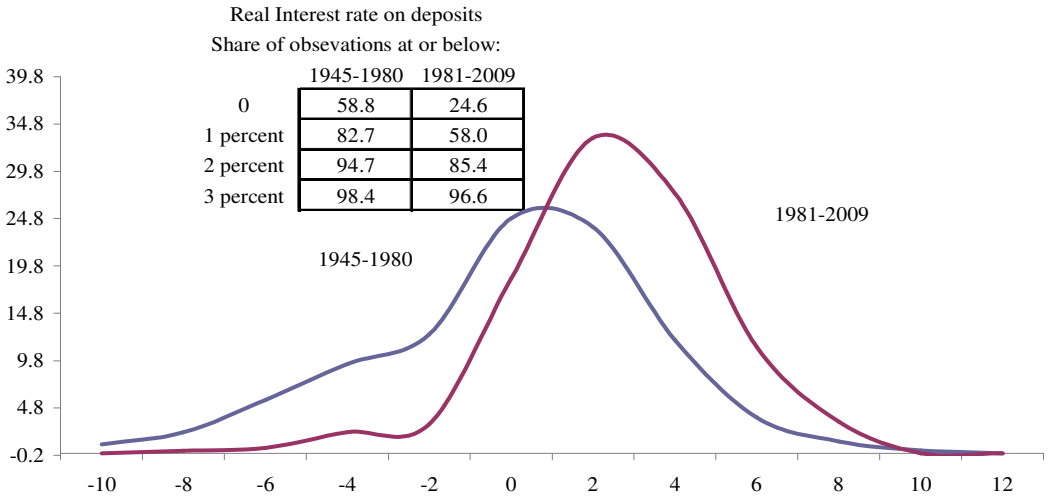
Treasury bill rate



Discount rate



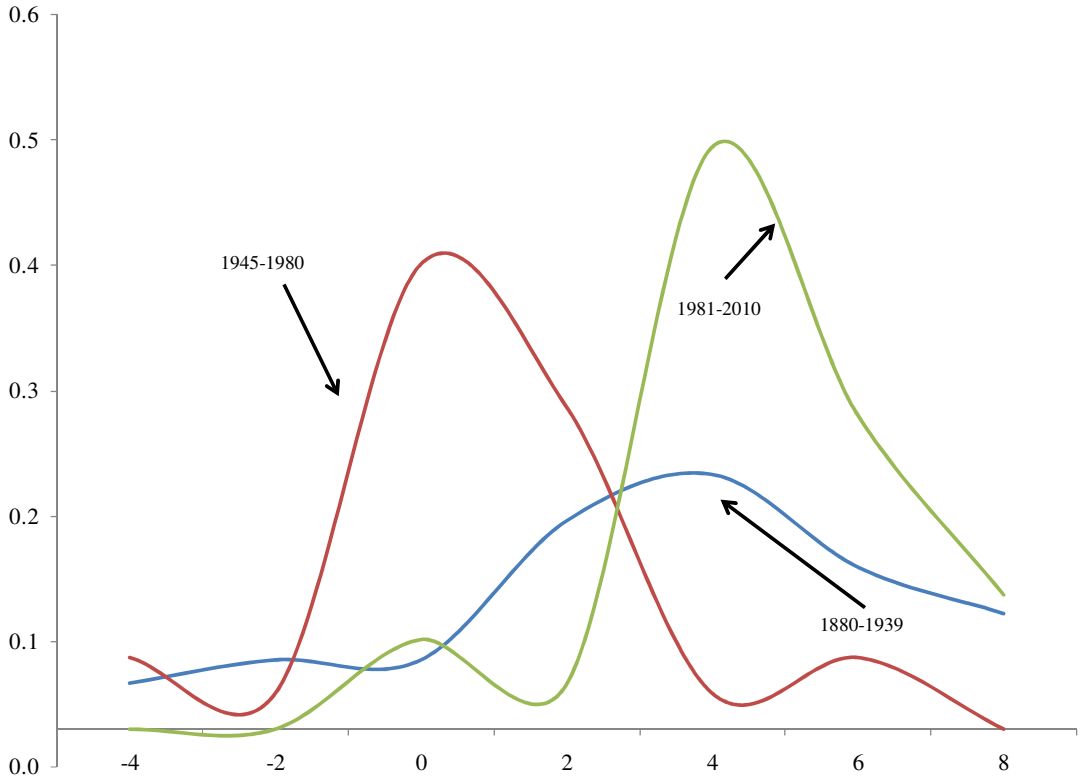
Deposit rate



The preceding analysis sets the general tone of what to expect, in terms of real rates of return on a portfolio of government debt, during the era of financial repression. For the United States, for example, Homer and Sylla (1963) describe 1946-1981 as the second (and longest) bear bond market in US history. [16] To reiterate the point that the low real interest rates of the financial repression era were exceptionally low not only in relation to the post-liberalization period but also to the more liberal financial environment of pre-World War II, Figure 6 plots the frequency distribution of real interest rates on deposits for the United Kingdom over three subperiods, 1880-1939[17], 1945-1980, 1981-2010.

[16] They identify 1899-1920 as the first US bear bond market.
[17] Excluding the WWI period.

Figure 6: Real Deposit Interest Rates Frequency Distributions: United Kingdom, 1880-2010



Sources: *International Financial Statistics,* International Monetary Fund, various sources listed in the Data Appendix, and authors' calculations.

The preceding analysis of real interest rates despite being qualitatively suggestive falls short of providing estimates of the magnitude of the debt-servicing savings and outright debt liquidation that accrued to governments during this extended period. To fill in that gap the next section outlines the methodological approach we follow to quantify the financial repression tax, while Section V presents the main results.

IV. The Liquidation of Government Debt: Conceptual and Data Issues

This section discusses the data and methodology we develop to arrive at estimates of how much debt was liquidated via a combination of low nominal interest rates and higher inflation rates, or what we term "***the liquidation effect.***"[18]

Data requirements. Reliable estimates of the liquidation effect require considerable data, most of which is not readily available from even the most comprehensive electronic databases. Indeed, most of the data used in these exercises comes from a broad variety of historical government publications, many which are quite obscure, as detailed in the Data Appendix. The calculation of the "liquidation effect" is a clear illustration of a case where the devil lies in the details, as the structure of government debt varies enormously across countries and within countries over time. Differences in coupon rates, maturity and the distribution of marketable and nonmarketable debt, securitized debt versus loans from financial institutions, importantly shape the overall cost of debt financing for the government. There is no "single" government interest rate (such as a 3-month t-bill or a 10-year bond) that is appropriate to apply to a hybrid debt stock. The starting point to come up with a measure that reflects the true cost of debt financing is a reconstruction of the government's debt profile over time.

Sample. We employ two samples in our empirical analysis. We use the database from Sbrancia (2011) of the government's debt profiles for 10 countries (Argentina, Australia, Belgium, India, Ireland, Italy, South Africa, Sweden, the United Kingdom, and the United States). These were constructed from primary sources over the period 1945-1990 where possible or over shorter intervals (determined by data availability) for a

[18] Table A.1.2 and its accompanying discussion also examines other approaches to quantifying the financial repression tax .

subset of the sample. For the benchmark or basic calculations (described below), this involves data on a detailed composition of debt, including maturity, coupon rate, and outstanding amounts by instrument. For a more comprehensive measure, which takes into account capital gains or losses of holding government debt, bond price data are also required. In all cases, we also use official estimates of consumer price inflation, which at various points in history may significantly understate the true inflation rates. [19] Data on Nominal GDP and government tax revenues are used to express the estimates of the liquidation effect as ratios that are comparable across time and countries.

For our broader analysis of the behavior of inflation during major debt reduction episodes, which has far less demanding data requirements (domestic public debt outstanding/GDP and inflation rates) our sample broadens to 28 countries from all regions for 1790-2010 (or subsamples therein). The countries and their respective coverage are listed in Appendix Table A.1.3.

1. Benchmark basic estimates of the "liquidation effect"

The debt portfolio. We construct a "synthetic portfolio" [20] for the government's total debt stock at the beginning of the year (fiscal or calendar, as noted). This portfolio reflects the actual shares of debts across the different spectrum of maturities as well as the shares of marketable versus nonmarketable debt.

[19] This is primarily due to the existence of price controls which were mainly imposed during WWII and remained for several years after the end of the conflict. See Friedman and Schwartz (1963) for estimates of the actual price level in the US and UK, and Wiles (1952) for post-WII U.K,

[20] The term "synthetic" is used in the sense that a hypothetical investor holds the ***total*** portfolio of government debt at the beginning of the period, which is defined as either the beginning of the calendar year or the fiscal year, depending on how the debt data is reported by the particular country. Country specifics are detailed in the data appendix. The weights in this hypothetical portfolio are given by the actual shares of each component of debt in the total domestic debt of the government.

Interest rate on the portfolio. The "aggregate" nominal interest rate for a particular year is the coupon rate on a particular type of debt instrument weighted by that instrument's share in the total stock of debt. [21] We then aggregate across all debt instruments. The real rate of interest,

$$r_t = \frac{i_{t-1} - \pi_t}{1 + \pi_t}$$

(where i and π are nominal interest and inflation rates, respectively) is calculated on an ex-post basis using CPI inflation for the corresponding one-year period. It is a before-tax real rate of return (excluding capital gains or losses). [22]

A definition of debt "liquidation years." Our benchmark calculations define a liquidation year, as one in which the real rate of interest (as defined above) is negative (below zero). This is a conservative definition of liquidation year; a more comprehensive definition would include periods where the real interest rate on government debt was below a "market" real rate.[23]

Savings to the government during liquidation years. This concept captures the savings (in interest costs) to the government from having a negative real interest rate on government debt. (As noted it is a lower bound on saving of interest costs, if the benchmark used assumed, for example a positive real rate of, say, two or three percent.) These savings can be thought of as having "a revenue-equivalent" for the government, which like regular budgetary revenues can be expressed as a share of GDP or as a share

[21] Giovannini and de Melo (1993) state "the choice of a "representative" interest rate on domestic liabilities an almost impossible task and because there are no reliable breakdowns of domestic and foreign liabilities by type of loan and interest rate charged." This is precisely the almost impossible task we undertake here. Their alternative methodology is described in appendix Table A.2.

[22] Some of the observations on inflation are sufficiently high to make the more familiar linear version of the Fisher equation a poor approximation.

[23] However, determining what such a market rate would be in periods of pervasive financial repression requires assumptions about whether real interest rates during that period would have comparable to the real interest that prevailed in period when market were liberalized and prices were market determined.

of recorded tax revenues to provide standard measures of the "liquidation effect" across countries and over time. The saving (or "revenue") to the government or the ***"liquidation effect"*** or the ***"financial repression tax"*** is the real (negative) interest rate times the "tax base," which is the stock of domestic government debt outstanding.

2. An alternative measure of the liquidation effect based on total returns

Thus far, our measure of the liquidation affect has been confined to savings to the government by way of annual interest costs. However, capital losses (if bond prices fall) may also contribute importantly to the calculus of debt liquidation over time. This is the case because the market value of the debt will actually be lower than its face value. The market value of government debt obviously matters for investors' wealth but also measures the true capitalized value of future coupon and interest payments. Moreover, a government (or its central bank) buying back existing debt could directly and immediately lower the par value of existing obligations. Once we take into account potential price changes, the total nominal return or holding period return (HPR) for each instrument is given by:

$$HPR_t = \frac{(P_t - P_{t-1}) + C_t}{P_{t-1}}$$

where P_t and P_{t-1} are the prices of the bond at time t and $t-1$ respectively, and C_t is the annual interest payment (i.e., the nominal coupon rate).

We use this total return measure as a supplement rather than as our core or benchmark "liquidation measure" (despite the fact that it incorporates more information on the performance of the bond portfolio). Bond price data are only available for a subset of the securities that constitute the government portfolio and, more generally, consistent

time series price data are more difficult to get for some of the countries in our sample. It is also worth noting that while price movements for different bonds are generally in the same direction during a particular year, there are significant differences in the magnitudes of the price changes. This cross-bond variation in price performance makes it difficult to infer what the price of nonmarketable debt (for which there is no price data altogether), as well as marketable bonds for which there is no price data. As before, we define "liquidation years" as those periods in which the real return of the portfolio is negative. [24]

3. The role of inflation and currency depreciation

The idea of governments using inflation to liquidate debt is hardly a new one since the widespread adoption of fiat currency, as discussed earlier.[25] It is obvious that for any given nominal interest rate a higher inflation rate reduces the real interest rate on the debt, thus increasing the odds that real interest rates become negative and the year is classified as a "liquidation year." Furthermore, it is also evident that for any year that is classified as a liquidation year the higher the inflation rate (for a given coupon rate) the higher the saving to the government.

Our approach helps to pinpoint periods (and countries) when inflation played a systematically larger role in eroding the debts of the government. In addition, we can disentangle to what extent this was done via relatively short-lived "inflation surprises" (unanticipated inflation) or through a steady and chronic dose of moderate inflation over extended time horizons. Because we do not have a direct measure of inflation

[24] As described in Appendix 2, we also calculate an alternative definition of "liquidation years" by comparing the real return of the government debt portfolio to the real return in the equity market. According to this definition, a given year is considered a "liquidation year" if the return in a given year for the government portfolio is below the return in the stock market; we use the most comprehensive stock market index available for each country

[25] See for example, Calvo's (1989) framework which highlights the role of inflation in debt liquidation even in the presence of short-term debt.

expectations for much of the sample, we define inflation bursts or "surprises" in a more mechanical, ex-post manner. Specifically, we calculate a ten-year moving average for inflation and classify those years in which inflation was more than two-standard deviations above the 10-year average as an "inflation burst/surprise year". As the 10-year window may be arbitrarily too backward looking, we also perform the comparable exercise using a five-year moving average.

V. The Liquidation of Government Debt: Empirical Estimates

This section presents estimates of the ***"liquidation effect"*** for ten advanced and emerging economies for most of the post-World War II period. Our main interest lies in the period prior to the process of financial liberalization that took hold during the 1980s—that is, the era of financial repression. However, as noted, this three-plus decade-long stretch is by no means uniform. The decade immediately following World War II was characterized by a very high public debt overhang—legacy of the war, a higher incidence of inflation, and often multiple currency practices (with huge black market exchange rate premiums) in many advanced economies.[26] The next decade (1960s) was the heyday of the Bretton Woods system with heavily regulated domestic and foreign exchange markets and more stable inflation rates in the advanced economies (as well as more moderate public debt levels). The 1970s was quite distinct from the prior decades, as leakages in financial regulations proliferated, the fixed exchange rate arrangements under Bretton Woods among the advanced economies broke down, and inflation began to resurface in the wake of the global oil shock and accommodative monetary policies in the

[26] See De Vries (1969), Horsefield (1969), Reinhart and Rogoff (2003).

United States and elsewhere. To this end, we also provide estimates of the liquidation of government debt for relevant subperiods.

1. Incidence and magnitude of the "liquidation tax"

Table 4 provides information on a country-by-country basis for the period under study; the incidence of debt liquidation years (as defined in the preceding section); the listing of the liquidation years; the average (negative) real interest rate during the liquidation years; and the minimum real interest rate recorded (and the year in which that minimum was reached). Given its notorious high and chronic inflation history coupled with heavy-handed domestic financial regulation and capital controls during 1944-1974, it is not surprising that Argentina tops the list. Almost all the years (97 percent) were recorded as liquidation years, as the Argentine real ex-post interest rates were negative in every single year during 1944-1974 except for 1953 (a just deflationary year). For India, that share was 53 percent (slightly more than one half of the 1949-1980 observations recorded negative real interest rates). Before reaching the conclusion that this debt liquidation through financial repression was predominantly an emerging market phenomenon, it is worth noting that for the United Kingdom the share of liquidation years was about 48 percent during 1945-1980. For the United States, the world's financial center, a quarter of the years during that same period Treasury debt had negative real interest rates.

As to the magnitudes of the financial repression tax (Table 4), real interest rates were most negative for Argentina (reaching a minimum of -53 percent in 1959). The share of domestic government debt in Argentina (and other Latin American countries) in total (domestic plus external) public debt was substantial during 1900-1950s; it is not

surprising that in light of these real rates the domestic debt market all but disappeared and capital flight marched upwards (capital controls notwithstanding). By the late 1970s Argentina and many other chronic inflation countries were predominantly relying on external debt.[27] Italian real interest rates right after World War II were as negative as 47 percent (in 1945). For the Unites States real rates were -8 to -9 percent during 1945-1947 on average the US had -3.5 percent real rates during the liquidation years).

Table 4: Incidence and Magnitude of the Liquidation of Public Debt: Selected Countries, 1945-1980

Country	Period	Share of Liquidation Years	Liquidation Years	Negative Real Interest Rate - Liquidation Years	
				Average	Min(Year)
(1)	(2)	(3)	(4)	(5)	(6)
Argentina	1944-1974	97.0	1944-1974	15.6	53.3 (1959)
Australia	1945-1968, 1971,1976	48.0	1946-1953,1955-1956,1971,1976	5.6	17.8 (1951)
Belgium[1]	1945-1974	48.0	1945-1948,1951,1963,1969-1974	4.2	9.6 (1974)
India	1949-1980	53.0	1949,1951,1957,1959-1960,1964-1968,1970,1972-1975,1977,1980	5.4	17.4 (1974)
Ireland	1965-1990	62.0	1965-1966, 1968-1977,1979-1982	4.5	11.1 (1974)
Italy[2]	1945-1970	41.0	1945-1947,1950-1951,1962-1964,1970	11.9	46.6[3] (1945)
South Africa	1945-1974	43.0	1945,1947-1949,1951-1952,1955-1957,1959-1961,1963	2.3	4.4 (1952)
Sweden	1945-1965, 1984-1990	35.7	1947-1948,1951-1952,1956-1958,1960,1962,1965	2.8	11.9 (1951)
United Kingdom	1945-1980	47.8	1948-1953,1955-1956,1958,1962,1965,1969,1971-1977,1979-1980	3.8	10.9 (1975)
United States	1945-1980	25.0	1945-1948,1951,1956-1957,1974-1975	3.5	8.8 (1946)

Notes: Share of liquidation years is defined as the number of years during which the real interest rate on the portfolio is negative divided by the total number of years as noted in column (2). The real interest rate is calculated as defined in equation (1).
[1]No data available for 1964-1968
[2] The average and minimum real interest rate during liquidation years were calculated over the period 1945-1970 to exclude war years.

[27] See Reinhart and Rogoff (2011)'s forgotten history of domestic debt.

[3] In 1944, the negative real return was 82.3 percent.

There are two distinct patterns in the ten-country sample evident from an inspection of the timing of the incidence and magnitude of the negative real rates. The first of these is the cases where the negative real rates (financial repression tax) were most pronounced in the years following World War II (as war debts were importantly inflated away). This pattern is most evident in Australia, the United Kingdom and the United States, although negative real rates re-emerge following the breakdown of Bretton Woods in 1974-1975. Then there are the cases where there is a more persistent or chronic reliance on financial repression throughout the sample as a way of funding government deficits and/or eroding existing government debts. The cases of Argentina and India in the emerging markets and Ireland and Italy in the advanced economies stand out in this regard.

The preceding analysis, as noted, adopts a very narrow, conservative calculation of both the *incidence* of the "liquidation effect" or the financial repression tax. Much of the literature on growth, as well as standard calibration exercises involving subjective rates of time preference assume benchmark real interest rates of three percent per annum and even higher. Thus, a threshold that only examines periods where real interest rates were actually negative is bound to underestimate the incidence of "abnormally low" real interest rates during the era of financial repression (approximately taken to be 1945-1980). To assess the incidence of more broadly defined low real interest rates, Table 5 presents for the 10 core countries the share of years where real returns on a portfolio of

government debt (as defined earlier) were below zero (as in Table 4), one, two, and three percent, respectively.[28]

In the era of financial repression that we examine here, real ex post interest rates on government debt did **not** reach **three** percent in a **single** year in the United States; in effect in nearly 2/3 of the years real interest rates were below one percent. The incidence of "abnormally low" real interest rates is comparable for the United Kingdom and Australia—both countries which had sharp and relatively rapid declines in public debt to GDP following World War II. [29] Even in countries with substantial economic and financial volatility during this period (including Ireland, Italy and South Africa), real interest rates on government debt above three percent were relatively rare (accounting for only about 20-23 percent of the observations.

[28] An alternative strategy would be to use a growth model to calibrate the relationship between the real interest rate and output growth for the counterfactual of free markets. That, however, would make the results model specific.

[29] "Abnormally low" by the historical standards which include periods of liberalized financial markets before and after 1945-1980; see Homer and Sylla's (1963) classic book for a comprehensive and insightful history of interest rates.

Table 5. Incidence of Liquidation Years for Different Real Interest Rate Thresholds: Selected Countries, 1945-1980

Country (1)	Period (2)	Share of Years with Real Interest Rate below: 0 percent(3)	1 percent(4)	2 percent (5)	3 percent (6)
Argentina	1944-1974	97.0	97.0	97.0	97.0
Australia	1945-1968, 1971,1976	48.0	65.4	80.8	92.3
Belgium[1]	1945-1974	48.0	65.4	72.0	80.0
India	1949-1980	53.0	62.5	71.9	78.1
Ireland	1965-1990	62.0	65.4	73.1	76.9
Italy[2]	1945-1970	41.0	50.0	53.8	76.9
South Africa	1945-1974	43.0	53.3	66.7	80.0
Sweden	1945-1965, 1984-1990	35.7	39.3	60.7	75.0
United Kingdom	1945-1980	47.8	72.2	86.1	97.2
United States	1945-1980	25.0	63.9	88.9	100.0

Notes: Share of liquidation years is defined as the number of years during which the real interest rate on the portfolio is negative divided by the total number of years as noted in column (2). The real interest rate is calculated as defined in equation (1).
[1]No data available for 1964-1968
[2] The average and minimum real interest rate during liquidation years were calculated over the period 1945-1970 to exclude war years.

2. Estimates of the Liquidation Effect

Having documented the high incidence of "liquidation years" (even by conservative estimates), we now calculate the magnitude of the savings to the government (financial repression tax or liquidation effect). These estimates take "the tax rate" (the negative real interest rate) and multiplies it by the "tax base" or the stock of debt, Table 6 reports these estimates for each country.

Table 6: Government Revenues (interest cost savings) from the ***"Liquidation Effect:"*** per year

Country	Period	Benchmark Measure "Liquidation effect revenues"		Alternative Measure of "Liquidation effect revenues"	
		% GDP	% Tax Revenues	% GDP	% Tax Revenues
Argentina	1944-1974	3.2	19.5	3.0	16.6
Australia	1945-1968, 1971,1978	5.1	20.3	n.a.	n.a.
Belgium	1945-1974	2.5	18.6	3.5	23.9
India	1949-1980	1.5	27.2	1.5	27.2
Ireland	1965-1990	2.0	10.3	n.a.	n.a.
Italy	1945-1970	5.3	127.5	5.9	143.5
South Africa	1945-1974	1.2	8.9	n.a.	n.a.
Sweden	1945-1965, 1984-1990	0.9	6.5	1.6	10.9
United Kingdom[1]	1945-1980	3.6	26.0	2.4	17.3
United States	1945-1980	3.2	18.9	2.5	14.8

Sources: See data appendix and sources cited therein and authors' calculations.
[1]Data on bond prices available from 1960 onwards.

The magnitudes are in all cases non-trivial, irrespective of whether we use the benchmark measure that is exclusively based on interest rate (coupon yields) or the alternative measure that includes capital gains (or losses) for the cases where the bond price data is available.

For the United States and the United Kingdom the annual liquidation of debt via negative real interest rates amounted on average from to 3 to 4 percent of GDP a year. Obviously, annual deficit reduction of 3 to 4 percent of GDP quickly accumulates (even without any compounding) to a 30 to 40 percent of GDP debt reduction in the course of a decade. For Australia and Italy, which recorded higher inflation rates, the liquidation effect was larger (around 5 percent per annum). Interestingly (but not entirely surprising), the average annual magnitude of the liquidation effect for Argentina is about the same as that of the US, despite the fact that the average real interest rate averaged

about -3.5 percent for the US and nearly -16 percent for Argentina during liquidation years in the 1945-1980 repression era. Just as money holdings secularly shrink during periods of high and chronic inflation, so does the domestic debt market. [30] Argentina' "tax base" (domestic public debt) shrank steadily during this period; at the end of World War II nearly all public debt was domestic and by the early 1980s domestic debt accounted for less than ½ of total public debt. Without the means to liquidate external debts, Argentina defaulted on its external obligations in 1982.

Countries like Ireland, India, Sweden and South Africa that did not experience a massive public debt build-up during World War II recorded more modest annual savings (but still substantive) during the heyday of financial repression.[31]

[30] These issues are examined in Reinhart and Rogoff (2011).
[31] It is important to note that while financial repression wound down in most of the advanced economies in the sample by the mid 1980s, it has persisted in varying degrees in India through the present (with its system of state-owned banks and widespread capital controls) and in Argentina (except for the years of the "Convertibility Plan," April 1991-December 2001).

Table 7. Debt Liquidation through Financial Repression: Selected Countries, 1945-1955

Country	Public debt/GDP			Annual average: 1946-1955	
	1945	1955 (actual)	1955 without repression savings (est.)[4]	"financial repression revenue"/GDP	inflation
Australia	143.8	66.3	199.8	6.2	3.8
Belgium[1]	112.6	63.3	132.2	4.6	8.7
Italy[2]	66.9	38.1	81.9	3.7	10.8
Sweden	52.0	29.6	59.1	1.8	5.0
United Kingdom[3]	215.6	138.2	246.9	4.5	5.9
United States	116.0	66.2	141.4	6.3	4.2

Sources: See data appendix and sources cited therein and authors' calculations; for debt/GDP see Reinhart (2010) and Reinhart and Rogoff (2011b).
[1]The debt-to-GDP ratio corresponds to 1946
[2] Italy was in default on its external debt 1940-1946
[3] The savings from financial repression are a lower bound, as we use the "official" consumer price index for this period in the calculations and inflation is estimated to have been substantially higher than the official figure (see for example Friedman and Schwartz, 1963).
[4] The simple cumulative annual savings without compounding.
Notes: The peaks in debt/GDP were: Italy 129.0 in 1943; United Kingdom 247.5 in 1946; United States 121.3 in 1946. An alternative interpretation of the financial repression revenue is simply as savings in interest service on the debt.

VI. Inflation and Debt Reduction

We have argued that inflation is most effective in liquidating government debts (or debts in general), when interest rates are not able to respond to the rise in inflation and in inflation expectations.[32] This disconnect between nominal interest rates and inflation can occur if: (i) the setting is one where interest rates are either administered or predetermined (via financial repression, as described); (ii) all government debts are fixed-rate and long maturities **and** the government has no new financing needs (even if there is no financial repression the long maturities avoid rising interest costs that would otherwise

[32] That is, the coefficient in the Fisher equation is less than one.

prevail if short maturity debts needed to be rolled over); and (iii) all (or nearly all) debt is liquidated in one "surprise" inflation spike.

Our attention thus far has been confined to the first on that list, the financial repression environment. The second scenario, where governments only have long-term, fixed-rate debt outstanding and have no new financing needs (deficits) remain to be identified (however, these authors have a sense such episodes are relatively rare). This leaves the third case where debts are swiftly liquidated via an inflation spike (or perhaps more appropriately surge). To attempt to identify potential episodes of the latter, we conduct two simple exercises.

In the first exercise, we identify inflation "surprises" for the core ten-country sample. In order to identify inflation surprises we calculate a 10-year moving average inflation, and count a year as an "inflation surprise" year if the inflation during that year is two standard deviations above the corresponding 10-year average.[33] Table 8 presents the results. The second column shows the share of years which are "inflation surprises" during the sample period while the third shows the share of years which are both an "inflation surprise" and a "liquidation year".

As Table 8 highlights, there is not much overlap between debt liquidation years and inflation surprises, as defined here. Averaging across the 10 countries, only 18 percent of the liquidation years coincide with an "inflation surprise." In the case of South Africa, for instance, none of the liquidation years overlap with inflation surprises. The high incidence of inflation surprises years during the early 1970s at the time of the surge

[33] The pertinent 10-year average for determining whether year *t* is an inflation surprise or not is calculated over the interval *t-10* to *t-1*.

in oil and commodity prices, suggests our crude methodology to identify "inflation surprises (or spikes)" may be a reasonable approximation to the real thing. More to the point, this exercise suggests that the role of inflation in the liquidation of debt is predominantly of the more chronic variety coupled with financially-repressed nominal interest rates.

Table 8: Do Inflation Surprises Coincide with Debt Liquidation? 10 countries, 1945-1980

Country	Share of "inflation surprise" years	Share of liquidation years which are also "inflation surprise" years	Inflation surprise years*
Argentina	26.7	27.6	1945,1946,1949-1951,1959,1972,1973
Australia	7.7	16.7	1951,1966
Belgium	12.0	25.0	1972-1974
India	6.3	10.5	1973,1974
Ireland	11.5	20.0	1970,1972,1973
Italy	7.7	18.2	1962,1963
South Africa	13.9	0.0	*1964,1971-1974*
Sweden	3.6	11.1	1951
United Kingdom	13.9	23.5	*1970,*1971,1973-1975
United States	25.0	22.2	1946,*1966,1968,1969, 1970,1973*,1974,*1979, 1980*

*Shown in *italics* are "inflation surprise" years which do **not** coincide with liquidation years.

Our algorithm for the second exercise begins by identifying debt-reduction episodes and then focusing on the largest of these. Any decline in debt/GDP over a three year window classifies as a debt-reduction episode. . For this pool of debt-reduction episodes, we construct their frequency distribution (for each country) and focus on the lower (ten percent) tail of the distribution to identify the "largest" three-year debt

reduction episodes. This algorithm biases our selection of episodes toward the more sudden (or abrupt) ones (even if these are later reversed) which might a priori be attributable to some combination of a booming economy, a substantive fiscal austerity plan, or a burst in inflation/liquidation, or explicit default or restructuring. A milder but steady debt reduction process that lasts over many years would be identified as a series of episodes—but if the decline in debt over any particular three-year window is modest it may not be large enough to fall in the lower ten percent of all the observations.

This exercise helps flag episodes where inflation is likely to have played a significant role in public debt reduction but does not provide estimates of how much debt was liquidated (as in the preceding analysis). Because we only require information on domestic public debt/GDP and inflation, we expand our coverage to 28 countries predominantly (but not exclusively) over 1900-2009. Thus, we are not exclusively focusing on the period of financial repression but examining more broadly into the role of inflation and debt reduction in the countries' histories.

Our algorithm begins by identifying debt-reduction episodes and then focusing on the largest of these. Any decline in debt/GDP over a three year window classifies as a debt-reduction episode. For this pool of debt-reduction episodes, we construct their frequency distribution (for each country) and focus on the lower (ten percent) tail of the distribution to identify the "largest" three-year debt reduction episodes. This algorithm biases our selection of episodes toward the more sudden (or abrupt) ones (even if these are later reversed) which might a priori be attributable to some combination of a booming economy, a substantive fiscal austerity plan, or a burst in inflation/liquidation, or explicit default or restructuring. A milder but steady debt reduction process that lasts over many

years would be identified as a series of episodes—but if the decline in debt over any particular three-year window is modest it may not be large enough to fall in the lower ten percent of all the observations.

Table 9 lists the largest debt reduction episodes by country, the last year of the 3-year episode is shown and for each country; the year that appears in *italics* represents the largest single-episode of debt reduction. The next two columns of the table are devoted to the average and median inflation performance during the debt reduction episodes listed in the second column in comparison to the inflation performance (average and median) for the full sample (the coverage, which varies by country, is shown in Table A.2). In 22 of 28 countries, inflation is significantly higher in the episodes of debt reduction than for the full sample. In the extreme cases, it is the wholesale liquidation of domestic debt, such as during the German hyperinflation of the early 1920s and the long-lasting Brazilian and Argentine hyperinflations of the early 1990s. Even without these extreme cases, the inflation differentials between the debt reduction episodes and the full sample are suggestive of the use of inflation (intentionally or because it became unmanageable) to reduce (or liquidate) government debts even in periods outside the era of heavy financial repressions. The evidence is only suggestive of this interpretation, as no explicit causal pattern is tested.

Table 9 Inflation Performance during Major Domestic Public Debt Reduction Episodes: 28 Countries, 1790-2009

	Major Debt Reduction Episodes*			Full Sample	
	Dates	Inflation		Inflation	
		Average	Median	Average	Median
Argentina	1900-*1902*,1990,2006-2007	479.8	8.2	82.5	8.6
Australia	1948,*1949*-1953	10.3	9.3	3.0	2.5
Belgium	1925-28, *1949*	10.7	12.8	2.0	1.9
Brazil	1990-*1992*,1995-1996	898.2	980.2	111.3	11.3
Canada	1948,*1949*-1952	7.3	5.3	3.2	2.5
Chile	*1993*-1997, 2004-2007	7.7	6.1	17.7	5.5
Colombia	*2008*, 2009	8.5	6.3	12.6	10.8
Egypt	2008	12.0	8.6	11.7	9.9
Finland	1946-1949	34.5	24.9	10.4	3.9
France	1924, 1926-1927, *1938*	11.1	12.6	6.4	2.7
Germany	1922, *1923*	5555049529.6	1764.7	231460401.3	2.3
Greece	*1925*-1927	23.7	12.8	8.0	5.1
India	*1958*, 1996, 2006	7.1	6.2	6.6	6.2
Ireland	1972, *1982*, 1998	9.8	8.6	5.9	3.7
Italy	1945, *1946*-1948	106.7	44.3	10.6	2.6
Japan	1898, *1912*-1913	7.6	6.7	3.6	2.6
Korea	1986	2.5	2.5	6.3	4.6
Malaysia	1995	8.4	8.8	6.9	5.4
Mexico	1991, *1992*, 1993	18.9	20.0	13.3	5.6
New Zealand	1935-*1937*, 1950-1952	4.9	5.3	4.2	2.8
Phillipines	1998, *2007*-2008	7.2	7.7	7.7	6.2
South Africa	1935, 1952, 1981, 2001-*2002*	7.0	6.6	5.8	4.9
Sweden	1948, 1952, 1989, *2001*-2003, 2009	4.7	3.2	4.4	3.2
Thailand	1989-*1990*	4.4	4.6	4.8	3.8
Turkey	1943, 2006-2008	23.2	9.2	25.3	9.7
UK	1836, 1846, 1854, 1936, 1940, 1948-*1950*,1951-1954	4.7	3.7	2.7	1.8
US	1794-1796, 1881-1882, 1948-*1952*, 1953, 1957, 1966	4.0	2.6	1.6	1.7
Venezuela	1989, *1997*-1998, 2006-2007	41.6	29.5	11.4	5.8

*A debt reduction episode is defined as a decline in the domestic public debt/GDP ratio over a three-year window. The dates shown are for the largest three-year declines recorded during the full sample period as shown in Table A.2.

Notes: The largest annual (single-year) decline recorded in debt/GDP is shown year shown in *italics* under the Dates column. For example, for Germany this was the hyperinflation year 1923; for the United States it was 1952, the year following a substantial debt conversion (see Table 2).

Concluding Remarks

The substantial tax on financial savings imposed by the financial repression that characterized 1945-1980 was a major factor explaining the relatively rapid reduction of public debt in a number of the advanced economies. This fact has been largely overlooked in the literature and discussion on debt reduction. The UK's history offers a pertinent illustration. Following the Napoleonic Wars, the UK's public debt was a staggering 260 percent of GDP; it took over 40 years to bring it down to about 100 percent (a massive reduction in an era of price stability and high capital mobility anchored by the gold standard). Following World War II, the UK's public debt ratio was reduced by a comparable amount in 20 years. [34]

The financial repression route taken at the creation of the Bretton Woods system was facilitated by initial conditions after the war, which had left a legacy of pervasive domestic and financial restrictions. Indeed, even before the outbreak of World War II, the pendulum had begun to swing away from laissez-faire financial markets toward heavier-handed regulation in response to the widespread financial crises of 1929-1931. But one cannot help thinking that part of the design principle of the Bretton Woods system was to make it easier to work down massive debt burdens. The legacy of financial crisis made it easier to package those policies as prudential.

To deal with the current debt overhang, similar policies to those documented here may re-emerge in the guise of prudential regulation rather than under the politically incorrect label of financial repression. Moreover, the process where debts are being

[34]Peak debt/GDP was 260.6 in 1819 and 237.9 percent in 1947. Real GDP growth was about the same during the two debt reduction periods (1819-1859) and (1947-1967), averaging about 2.5 percent per annum (the comparison is not exact as continuous GDP data begins in 1830). As such, higher growth cannot obviously account for the by far faster debt reduction following World War II.

"placed" at below market interest rates in pension funds and other more captive domestic financial institutions is already under way in several countries in Europe. There are many bankrupt (or nearly so) pension plans at the state level in the United States that bear scrutiny (in addition to the substantive unfunded liabilities at the federal level).

Markets for government bonds are increasingly populated by nonmarket players, notably central banks of the United States, Europe and many of the largest emerging markets, calling into question what the information content of bond prices are relatively to their underlying risk profile. This decoupling between interest rates and risk is a common feature of financially repressed systems. With public and private external debts at record highs, many advanced economies are increasingly looking inward for public debt placements.

While to state that initial conditions on the extent of global integration are vastly different at the outset of Bretton Woods in 1946 and today is an understatement, the direction of regulatory changes have many common features. The incentives to reduce the debt overhang are more compelling today than about half a century ago. After World War II, the overhang was limited to public debt (as the private sector had painfully deleveraged through the 1930s and the war); at present, the debt overhang many advanced economies face encompasses (in varying degrees) households, firms, financial institutions and governments.

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Appendix I. Appendix Tables and Literature Review

Table A1.1. Real Interest Rates during Financial Repression and Post-Liberalization

	Year of Liberalization		Average Real: Deposit Rate	Discount Rate	Interbank Rate	Lending Rate	T-Bill Rate
			(in percent)				
Argentina	1991	Before	23.99	-28.12			
		After	0.97	-2.55			
Australia	1980	Before	-2.83	-0.64	-1.80	-0.04	-2.66
		After	2.61	3.86	3.83	6.98	3.46
Belgium*	1980	Before	-0.50	1.29	-0.38	3.21	2.19
		After	1.75	4.14	3.68	6.94	2.96
Brazil	1989	Before	18.69	0.58	-3.61		-0.21
		After	46.41	145.46	76.97		-21.87
Canada	1967	Before	2.07	-0.11		3.83	-0.65
		After	1.04	2.47		3.71	2.15
Chile	1984	Before	12.88	-12.49		28.39	
		After	3.35	5.61		8.22	
Colombia	1980	Before	-5.37	-3.64		-0.79	
		After	6.14	7.72		11.04	
Egypt	1991	Before	-5.65	-0.40		-1.43	
		After	0.99	3.78		6.00	
Finland	1982	Before	-2.68	-2.83	1.43	-1.12	
		After	1.46	2.94	4.00	4.51	
France	1984	Before	-3.09	-3.28	0.21	-0.46	-3.22
		After	1.33	4.92	4.58	5.70	3.20
Germany*	1980	Before	0.94	0.69	1.11	3.92	0.60
		After	2.32	1.98	2.60	7.92	2.41
Greece*	1980	Before	0.52	0.57		3.36	-1.88
		After	0.19	2.88		6.19	0.93
India	1992	Before		0.26	0.38	6.77	
		After		1.11	1.45	5.86	
Ireland*	1980	Before	-4.02	0.04	-1.84	-1.52	-2.16
		After	-1.11	4.12	3.13	3.57	2.84
Italy	1983	Before	-3.30	-2.97	-1.44	1.47	-2.66
		After	0.94	4.70	3.59	6.22	3.32
Japan	1979	Before	-2.13	-7.18	0.53	1.60	-1.61
		After	0.52	1.11	1.77	2.97	1.31
Korea	1991	Before	3.71	-1.71	5.19	3.38	7.94
		After	2.79	-0.56	3.75	3.93	4.08
Malaysia	1987	Before	1.86	1.05	-0.32	6.96	0.82
		After	1.90	1.87	1.72	5.35	1.57

Table A.1. Real Interest Rates during Financial Repression and Post-Liberalization (concluded)

	Year of Liberalization		Average Real: Deposit Rate	Discount Rate	Interbank Rate	Lending Rate	T-Bill Rate
			(in percent)				
Mexico	1988	Before	-2.82		-1.47		-6.62
		After	-1.19		1.96		2.88
New Zealand	1984	Before	-2.96	-0.40		-1.79	-3.08
		After	4.01	5.15		8.18	4.83
Philippines	1981	Before	-3.74	-0.62	-2.44	-0.64	-1.98
		After	1.23	0.35	2.95	5.70	3.57
South Africa	1980	Before	-4.33	-0.40	-1.30	1.95	-1.61
		After	1.72	2.56	2.09	5.56	1.82
Sweden	1980	Before	-0.55	-0.51	-0.29	1.23	-0.61
		After	1.28	1.19	3.88	5.12	2.97
Thailand	1989	Before	4.03	4.31	4.82	7.08	1.61
		After	2.39	3.10	2.22	5.83	-0.16
Turkey	1987	Before	-10.77	-3.68			4.69
		After	2.06	-0.84			3.99
United Kingdom	1981	Before	-2.41	-0.14	-6.22	-2.00	-1.23
		After	3.20	3.68	3.88	4.54	3.64
United States	1982	Before	2.04	-0.12	1.00	2.09	-0.31
		After	1.43	1.61	2.19	4.72	1.77
Venezuela	1996	Before	-8.06	-0.18		-5.56	
		After	-7.50	6.68		-1.64	

Table A1.2. Measuring "Taxes" from Financial Repression: Selected Papers

Study	Measure(s) of financial repression	Sample and coverage	Highlight of findings
Agenor and Montiel (2008)	End-of-year effective reserve requirements ratios are calculated (see entry under Brock). The authors calculate how important a share of seignorage is accounted for by the reserve requirement tax.	32 advanced and emerging market economies 1980-1991.	Reserve ratios are higher for emerging markets. Among the advanced economies the highest share of seignorage accounted for by reserve ratios is Italy over this period. For the emerging markets, Chile and Peru have the highest readings.
Beim and Calomiris (2001)	Six measures (real interest rates, reserve ratio, liquidity, private borrowing, bank lending, and stock market capitalization) of financial repression are used to construct an aggregate index. Their aim is to provide a broad-brush cross-country comparison at a particular point in time—not a "tax equivalent" to the government.	All countries, advanced and emerging-data permitting. The most comprehensive coverage is for 1997. The annual indices are reported for 1970 and for 1990 for a subset of countries. The period of heaviest repression 1945-early 1970s is not part of the analysis.	Based on the cross-sectional evidence, the authors conclude that financial development (the opposite of repression) contributes importantly to economic development and growth.
Brock (1989)	End-of-year effective reserve requirements ratios are calculated as base money less currency in circulation (central bank reserves) divided broad money (or money plus quasi-money). Looks at the correlation between inflation rates and the reserve ratio.	41 advanced and emerging market economies 1960-1984.	Reserve ratios are higher for emerging markets. Among the advanced economies these are highest for Australia and Italy over this period. A positive relationship between inflation and reserve requirements is mostly present in the chronic high inflation countries of Africa and Latin America.
Easterly (1989)	Net domestic transfers from the financial system and tax on financial intermediation. Uses inflation-adjusted flow of funds analysis to calculate the size of the transfers from reserve requirements, inflation tax, etc,	A dozen relatively large emerging markets. Flow-of-funds balance sheet from 1971 to1986.	Estimates are highest for Mexico and Yugoslavia among the 12 countries, reaching 12-16 percent of GDP in some years.
Easterly and Schmitt-Hebbel (1994)	Focus on real interest rates on deposits and calculate the repression tax revenue (from that source) as the difference between domestic rates and comparable rates in OECD countries multiplied by the end-of-period stock of deposits (the tax base).	Nine emerging markets, 1970-1988 (the revenue calculations are for less than half of the countries)	This component of the financial repression tax is in the order of 1-2 percent of GDP.

Study	Measure(s) of financial repression	Sample and coverage	-Highlight of findings
Giovannini and de Melo (1993)	The effective interest rate on external (domestic) debt are calculated as the ratio of external (domestic) interest payments to the stock of external (domestic) debt. The government revenue from financial repression is calculated by computing the differential between the foreign borrowing cost and the domestic borrowing cost, times the average annual stock of domestic debt.	Roughly 1974-1987 (usually shorter period), depending on the country. The 24-developing-country sample does include Greece and Portugal as emerging markets.	Annual estimates of the "revenue from financial repression" are estimated from a low of 0.5 percent of GDP for Zaire (with its small domestic debt market to a high of about 6 percent for Mexico. Estimates for Greece and Portugal are 2-2.5 percent of GDP.

Table A1.2 sketches the approach, sample and findings of six papers that have in different ways attempted to quantify some of the dimensions of financial repression. While Beim and Calomiris (2001) primarily aim to rank a cross section of countries at a point (or two) in time to link the measures extent of financial repression to growth and development, the remaining papers do attempt to quantify some of the financial repression "revenue" equivalents. For instance, the papers dealing with reserve requirements capture the tax on financial institutions. Ultimately, (as Reinhart and Reinhart, 1999 document) the banks pass this tax on to depositors (via lower deposit rates), non-government borrowers (via higher lending rates) or both, depending who has the most access to alternatives. If households are barred from holding foreign assets and/or gold (see Table 2), lower deposits are tolerated more readily. If domestic banks are the only game in town for the firms—they will have to live with the higher lending rates.

The Giovannini and deMelo (1993) paper is closest in spirit to our fundamental two-part intertwined question (i) what is the annual saving on interest payments domestic debt? (ii) what the magnitude of the erosion or liquidation on the existing stock of debt

due to negative real interest rates. Giovannini and de Melo (1993) compare "effective interest rates" on external debt to the potentially repressed "effective interest rates on domestic debt" (See Table A1.2). This is a natural exercise for emerging markets (the focus of their analysis) for the period that they consider (1974-1987), as emerging market governments were funding themselves through both domestic and external borrowing (in varying degrees), as documented by Reinhart and Rogoff (2011). The market-determined interest rate on external debt is a logical benchmark under such circumstances. However, there are two compelling reasons why this approach is neither feasible nor desirable for our purposes. First, some countries (like the United States and the Netherlands) do not have and have not had historically external debt.[35] All government debts are issued under domestic law and in the domestic currency, irrespective of whether the holders of the debt are domestic pension funds or foreign central banks. Second, most emerging markets had little or no external debt during the heyday of the financial repression era during Bretton Woods (1945-1973); the depression of the 1930s and the subsequent world war had all but eradicated global debt markets.

[35] Apart from a trivial amount of Carter-bonds in the 1970s the US debt is domestic (homogenous) whether it is held by residents or nonresidents

Table A1.3 Extended Sample for Inflation and Domestic Debt Reduction Analysis: 28 Countries, 1790-2009

Country	Sample Period	Country	Sample Period
Argentina	1884-2009	Italy	1914-2009
Australia	1914-2009	Japan	1885-1940, 1952-2009
Belgium	1920-1939,1946-2009	Korea	1976-2005
Brazil	1900-2009	Malaysia	1955-1957, 1976-2009
Canada	1925-2007	Mexico	1918-1967, 1976-2009
Chile	1927-1930,1937-1953,1978-2009	New Zealand	1932-2008
Colombia	1923-2009	Philippines	1948-2009
Egypt	1993-2009	South Africa	1911-2009
Finland	1915-2009	Sweden	1880-2009
France	1920-1938, 1949-2009	Thailand	1950-2009
Germany	1920-1938, 1950-2009	Turkey	1933-1972, 1976-2009
Greece	1920-1939, 1950-1965, 1978-1981, 1993-2009	United Kingdom	1830-2009
India	1950-2009	United States	1790-2009
Ireland	1948-2008	Venezuela	1921-2009

Sources: Reinhart and Rogoff (2009) and (2011) and sources cited therein.

Appendix II. Data Appendix

Table A.2.1 Structure of Domestic Government Debt: Coupon, Maturity, Bond Prices, and Tax Revenues

Country	Period Covered	Source	Notes
Argentina	1944-1974	Ministerio de Hacienda	***Detailed composition of government debt*** is taken to indicate here as having data on: Outstanding debt stock (end of calendar or fiscal year) by coupon yield (instrument by instrument). Maturity of each instrument. In some cases it includes information on the marketable/nonmarketable distinction. Tax revenues. Prices of government bonds.
	1944-1974	Banco Central de la República Argentina	
Australia	1945-1968	Australia Bureau of Statistics	Detailed composition of government debt (see above).
	1971,1976	The Parliament of the Commonwealth of Australia	
Belgium	1945-1974	Banque Nationale de Belgique	Detailed composition of the government debt and bond prices.
Brazil	1964-1993	Banco Central do Brasil	Some debt data. Information on coefficient of monetary correction.
		Series Historicas. Divida Publica	Debt data, maturity structure
		Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1988- IBGE	Tax Revenues, GDP
India	1949-1980	Reserve Bank of India	Detailed composition of the government debt, bond prices and tax revenues.
Ireland	1965-1990	Department of Finance	Detailed debt data
	1965-1990	Central Statistics Office	Tax Revenues
Italy	1945-1970	Istituto Centrale di Statistica	Detailed composition of the government debt.
	1951-1970	Banca d'Italia	
South Africa	1945-1980	Control and Audit Office	Detailed composition of the government debt and tax revenues.

Source: Sbrancia (2011) and sources cited therein.

Table A2.1 Structure of Domestic Government Debt: Coupon, Maturity, Bond Prices, and Tax Revenues (continued)

Country	Period	Source	Notes
Sweden	1945-1965, 1984-1990	Riksgäldskontoret	Tax Revenues
		Fiscal Statistics for Sweden 1719-2003	
United Kingdom	1945-1980	Bank of England	Bond price data begins in 1960
	1945-1980	Central Statistical Office	Detailed composition of the government debt. Tax Revenues
United States	1945-1980	Department of Treasury	Detailed composition of the debt, tax revenues
	1945-1980	Center for Research in Securities Prices (CRSP) database	Bond prices

Source: Sbrancia (2011) and sources cited therein.

Table A.2.2 Two Examples of Government Debt Profiles. India and the United States

India: Composition of Domestic Debt for Selected Years, 1950-1970
(as percentage of total domestic debt)

	1950	**1960**	**1970**
Marketable Rupee Loans	59	48	39
Treasury Bills	15	25	21
Small Savings	17	17	19
Other Obligations	9	10	21

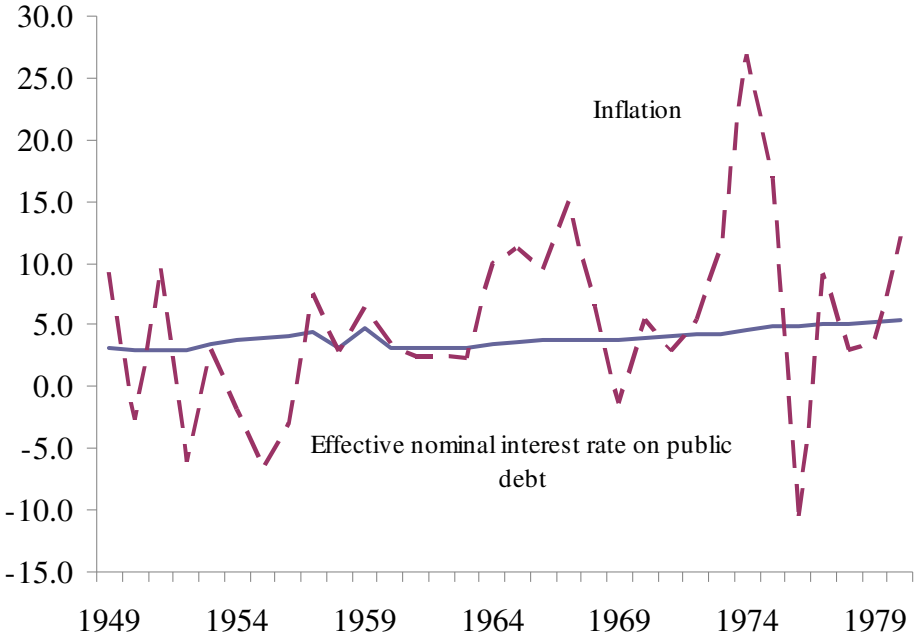
United States: Composition of Domestic Debt for Selected Years, 1946-1976
(as percentage of total domestic debt)

	1946	**1956**	**1966**	**1976**
Interest bearing obligations				
Marketable obligations	67.3	58.0	65.8	64.5
Treasury Bills	6.5	9.1	20.3	25.1
Certificates of Indebtedness	11.4	6.9		
Treasury Notes	3.8	12.8	17.8	33.2
Treasury Bonds	45.5	29.2	27.7	6.2
Other Bonds	0.1	0.0	0.0	0.
Non-marketable obligations	22.7	24.7	16.7	35.4
Special Issues	9.4	16.5	16.6	n.a.
Matured debt on which interest has ceased	0.2	0.3	0.1	0.1
Debt bearing no interest	0.4	0.6	0.8	0.1

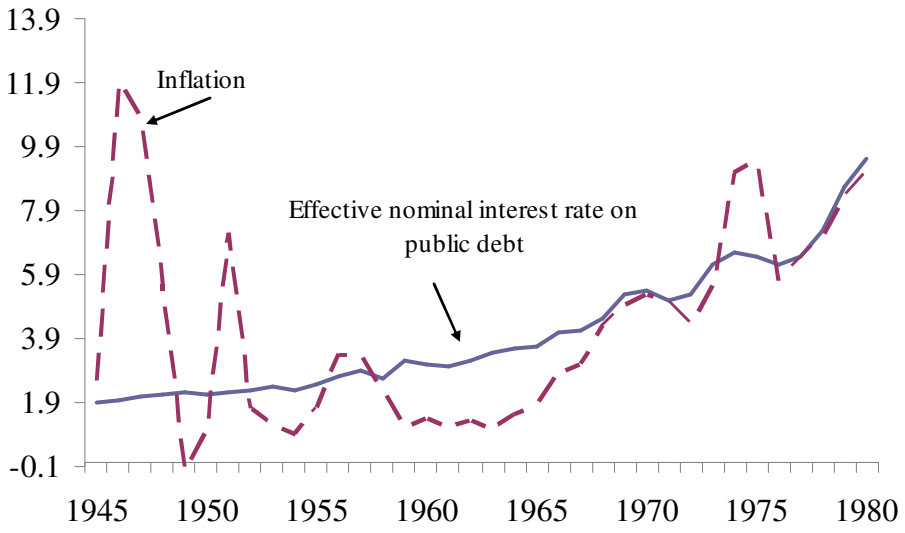
Source: Sbrancia (2011) and sources cited therein.

Figure A. 2.1 Two Examples of Effective Nominal Interest Rates on Public Debt: India and the United States

India, 1949-1980



United States, 1945-1980



Source: Sbrancia (2011).

Table I.2 Interest Rates: deposit, discount, lending and T-Bill rates.

Country	Interest Rate	Source
Argentina	Deposit Rate	Banco Central de la Republica Argentina
	Discount Rate	
	Lending Rate	
Australia	Deposit Rate	Reserve Bank of Australia
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Belgium	Deposit Rate	Banque Nationale de Belgique
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Brazil	Deposit Rate	Banco Central do Brasil
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Canada	Deposit Rate	Bank of Canada
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Chile	Deposit Rate	Banco Central de Chile
	Discount Rate	
	Lending Rate	
Colombia	Deposit Rate	Banco de la Republica de Colombia
	Discount Rate	
	Lending Rate	
Egypt	Deposit Rate	Central Bank of Egypt
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Finland	Deposit Rate	Bank of Finland
	Discount Rate	
	Lending Rate	
France	Deposit Rate	Banque de France
	Discount Rate	
	Lending Rate	
	T-Bill Rate	

Country	Interest Rate	Source
Germany	Deposit Rate	Deutsche Bundesbank
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Greece	Deposit Rate	Bank of Greece
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
India	Discount Rate	Reserve Bank of India
	Lending Rate	
	T-Bill Rate	
Ireland	Deposit Rate	Central Bank of Ireland
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Italy	Deposit Rate	Banca d'Italia
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Japan	Deposit Rate	Bank of Japan
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Korea	Deposit Rate	Bank of Korea
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Malaysia	Deposit Rate	Bank Negara Malaysia
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Mexico	Deposit Rate	Banco de Mexico
	Lending Rate	
	T-Bill Rate	
New Zealand	Deposit Rate	Reserve Bank of New Zealand
	Discount Rate	
	Lending Rate	
	T-Bill Rate	

Country	Interest Rate	Source
Philippines	Deposit Rate	Bangka Sentral Ng Pilipinas
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
South Africa	Deposit Rate	South Africa Reserve Bank
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Sweden	Deposit Rate	Sveriges Riksbank
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Thailand	Deposit Rate	Bank of Thailand
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
Turkey	Deposit Rate	Turkiye Cumhuriyet Merkez Bankasi
	Discount Rate	
	T-Bill Rate	
United Kingdom	Deposit Rate	Bank of England
	Discount Rate	
	Lending Rate	
	T-Bill Rate	
United States	Deposit Rate	Federal Reserve Bank of St. Louis
	Discount Rate	
	Lending Rate	
	T-Bill Rate	Board of Governors of the Federal Reserve System
Venezuela	Deposit Rate	Banco Central de Venezuela
	Discount Rate	
	Lending Rate	