# Private Debt Booms and the Real Economy: Do the Benefits Outweigh the Costs?

Emil Verner[†]

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**Abstract**

Probably not. Economic development coincides with rising private debt-to-GDP. This partly reflects the economic benefits of credit *deepening*, which facilitates a better allocation of savings towards productive investment. However, private debt *booms*, episodes of rapid expansion in private debt-to-GDP, systemically predict growth slowdowns that result in lower real GDP. Debt booms distort the economy by boosting demand instead of productive capacity and by fueling asset price booms. These booms leave in their wake private debt overhang, banking sector distress, and an overvalued real exchange rate. Private debt booms are thus distinct from credit deepening episodes, and the costs of these booms likely outweigh the benefits.

[†]Massachusetts Institute of Technology, Sloan School of Management; everner@mit.edu. I thank Holger Mueller, Karsten Müller, Moritz Schularick, and Ole Risager for valuable comments and Fanwen Zhu for outstanding research assistance.

# 1 Introduction

Private debt booms are episodes of rapid expansion in credit to households and firms. These booms have been playing an increasingly prominent role in economic fluctuations over the past few decades. A rapid expansion in debt can reflect structural improvements in the financial sector's ability to intermediate funds towards productive investment or an acceleration in productivity growth. Thus, private debt booms may part of the road to financial and economic development through the beneficial effects of *credit deepening*.

However, debt booms have also been followed by growth slowdowns and severe financial crises. Debt booms can generate distortions in the economy, fuel asset price booms and busts, increase banks' vulnerability to losses, and saddle the private sector with debt overhang that depresses consumption and investment. Instead of facilitating economic development, debt booms may be periods of excessive lending that increase *financial fragility* and sow the seeds of a future economic crash.

Ten years after the trough of the Great Recession, it is useful to revisit a crucial set of questions about debt booms. How should policymakers, market participants, and economic theory view private debt booms? Do the benefits of potential credit deepening outweigh the costs of potentially higher financial fragility? And what are the key channels through which debt booms propagate to the real economy?

In this paper, I revisit the connection between private debt booms and the real economy using recently assembled unbalanced panel data covering 143 countries over the past six decades. Along the way, I review the rapidly growing literature on the connection between debt booms, growth, and crises.

Across countries, the level of private debt-to-GDP, a proxy for financial development, is strongly positively associated with real income per capita. Moreover, expanding credit depth over the past 40 years is strongly correlated with real GDP growth over the same period. Thus, long-run economic growth goes hand in hand with credit deepening.

In sharp contrast to gradual financial development over the long run, pri-

vate debt *booms* are associated with short-term real GDP booms followed by future growth slowdowns. The future growth slowdown implies that private debt booms are not, on average, followed by a higher future level of real GDP. Taken at face value, the data suggest that real GDP may actually be lower in the long-run following a debt boom, relative to a counterfactual without a boom. Not only do private debt booms generate boom-bust cycles, but the busts overwhelm the booms.

Debt booms are unlikely to represent episodes of credit deepening. Examining how debt booms propagate to the real economy provides insights into why debt booms are not beneficial for growth. In particular, the evidence shows that debt booms affect the real economy through completely different channels than those that drive beneficial credit deepening.

To understand how debt booms propagate to the real economy, we first need to understand what drives the expansion in lending during debt booms. Debt booms coincide with declines in credit spreads and an increase in credit availability to riskier borrowers. This indicates that these booms are driven by an expansion in *credit supply*, not by increased demand for credit due to fundamental productivity improvements. That is, debt booms are driven by an increased willingness to lend on the part of financial intermediaries.

The credit supply expansion can finance either an expansion in *demand* or an increase in the economy's *productive capacity*. Key patterns in the data indicate that private debt booms largely boost demand instead of productive capacity. In particular, debt booms coincide with an expansion in non-tradable employment relative to tradable employment and with real exchange rate appreciation. Debt booms also finance surging imports but are associated with a slowdown in exports. In addition, debt booms fuel unsustainable house price booms, which create additional distortions by reallocating resources toward the less productive construction sector.

Once the credit cycle that drives the expansion in debt reverses, the economy slows due to a combination of factors resulting from the imbalances generated in the boom. Banking sector losses lead to a sharp contraction in credit supply that depresses consumption and investment. The overhang of debt ac-

cumulated in the boom itself depresses demand and leads to asset fire sales. House price declines reinforce the decline in demand by depressing borrowers' net worth. Real exchange rate overvaluation combined with nominal rigidities generate sustained output losses when demand falls in the bust. The bust is further exacerbated by real rigidities, which slow reallocation from the bloated non-tradable sector to the tradable sector.

Therefore, while credit deepening may contribute to economic development, this is unlikely to happen through rapid debt booms. Such booms are instead often episodes when credit expands for reasons unrelated to economic fundamentals, and where the expansion generates distortions and vulnerabilities that often end in crisis. In short, credit booms are not the way toward financial development-led growth, and we should view debt booms and credit deepening as fundamentally different phenomena that operate through different channels.

# 2 Credit deepening: The potential benefits of a debt boom

Why might a debt boom be a good sign for economic growth? The potential benefits of a private debt boom come from credit deepening. Theory and a large body of empirical evidence suggest that a better functioning financial system contributes to and facilitates higher GDP growth. Credit depth measures, such as private debt-to-GDP, may proxy for such financial development (King and Levine (1993), Levine (2004)). Private debt booms may thus simply be periods of accelerating credit deepening.

Figure 1 presents the striking positive correlation between credit depth and real income per capita across countries. The data on real GDP and population are from the World Bank's *World Development Indicators* database. Private debt-to-GDP is from the BIS *Long series on credit to the private sector* and the IMF's *Global Debt Database*.[1] The complete sample is listed in Table 1.

[1]In all the analysis in this paper, I drop countries that do not have at least 20 years of GDP

The figure shows that countries that are more economically developed have higher private debt-to-GDP ratios. Each observation represents the level of real GDP per capita and the level of credit to GDP in 2015 for each country in the sample. The dotted line captures the estimated non-parametric relation between private debt-to-GDP and real GDP per capita. This is the country-level *income-debt curve*.

**Figure 1: Higher income countries have higher credit depth**


*Notes*: This figure presents a country-level scatterplot of private debt-to-GDP against log real GDP per capita. Both variables are measured in 2015. Private debt-to-GDP is the from the BIS *Long series on credit to the private sector* and the IMF's *Global Debt Database*. Real GDP per capita is from the World Bank's *World Development Indicators*.

The positive relation in Figure 1 implies that moving from a level of private debt-to-GDP of 100 percent to 170 percent (a one standard deviation increase) is associated with an increase in income per capita from $10,000 to $27,000,

and private debt data, as well as countries with a population lower than half a million.

a 170 percent difference. This strong positive relation has intrigued empirical researchers since a version of it was first documented by Goldsmith (1969).

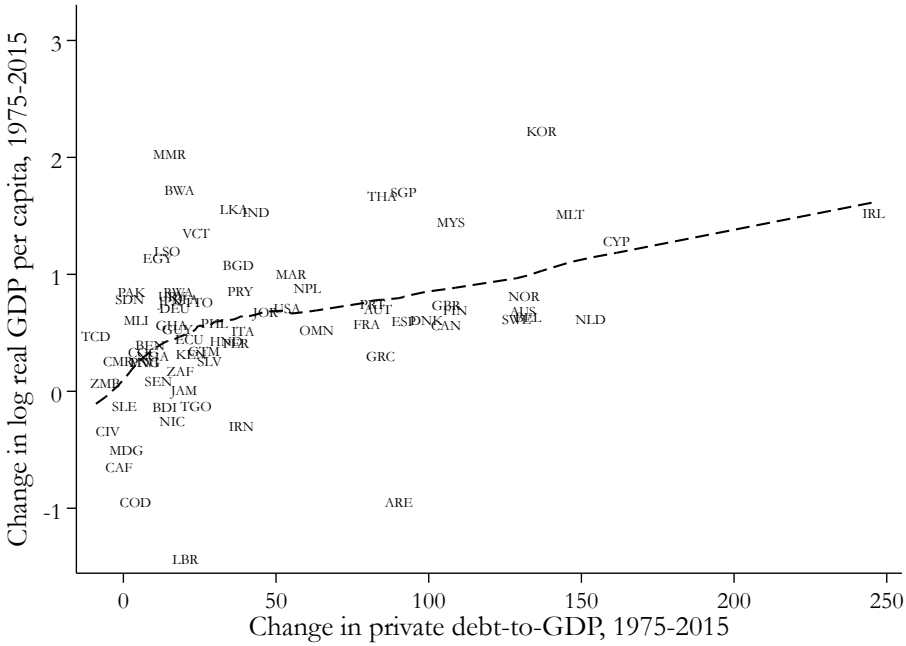
Interestingly, the relation in Figure 1 is also concave. The positive relation flattens out once debt-to-GDP exceeds about 200 percent. This suggests that any potential benefits of expanding private debt-to-GDP may be lower in more advanced economies. Differences in credit depth across advanced economies partly reflect different institutional features. For example, countries with funded pension systems tend to have higher household debt levels, as households borrow against illiquid pension wealth (Scharfstein (2018)).

Income per capita and credit depth are not only strongly correlated in levels. Long-run economic development also goes hand-in-hand with financial development. Figure 2 reveals that countries that have seen stronger economic growth over the past 40 years have also seen stronger financial development in terms of credit market depth. This implies that the correlation in Figure 1 is not solely driven by historical fixed differences across countries that determine both real income and credit depth.

Figures 1 and 2 suggest that credit depth, and financial development more generally, play an active role in increasing real output. A large "finance-growth" literature over the past three decades argues that better functioning credit and financial markets boost output (see Levine (2004) for an overview). Convincing causal evidence is difficult to come by, but some studies have found that open and better functioning financial markets increase real GDP growth.

Greater access to credit can increase output through several channels, all of which ultimately boost the *productive capacity* of the economy. Expanding credit can increase access to finance for constrained firms and, at the same time, lower the cost of capital, leading to an increase in investment. Expanding credit may be part of financial deepening that leads to a more efficient allocation of savings to investment (Greenwood and Jovanovic (1990)) and a better allocation of capital across firms (Larrain and Stumpner (2017)). Greater access to credit may also increase firm entry and product market competition (Varela (2018)). Rising debt may also result from "efficient bubbles," where bubbles in the price of capital relax financing constraints for productive

**Figure 2: Economic development goes hand in hand with credit market development**




*Notes*: This figure presents a country-level scatterplot of the change in private debt-to-GDP from 1975 to 2015 against the change in log real GDP per capita over the same period.

entrepreneurs, again leading to more productive investment (Martin and Ventura (2012)). Moreover, credit can allow firms to expand demand for skilled labor (Fonseca and Van Doornik (2018)). Credit booms may also be driven by improving institutions such as property rights and creditor protections.

Figures 1 and 2, of course, do not prove that credit deepening *causes* higher income per capita. Causality certainly also runs from income per capita to credit depth. Higher productivity growth increases the demand for credit from businesses who can take advantage of new investment opportunities. Rising debt, to a large extent, may follow real economic progress. However, even when credit follows real economic improvements, access to credit reinforces the benefits of productivity advances by allowing firms to invest. Moreover,

access to credit allows households to reap the welfare benefits of expected future income growth by borrowing to smooth consumption. Indeed, most of the increase in global private debt over the past four decades has been driven by household loans, both in advanced and emerging economies (Jordà, Schularick and Taylor (2014), Müller (2018*a*)).

# 3 Private debt booms and real GDP

## 3.1 Debt booms predict lower future real GDP

Are private debt booms a reflection of credit deepening? That is, are these booms part of the path up the "income-debt" curve in Figure 1? Or are debt booms periods of excessive lending that do not result in higher real GDP and may even lead to growth slowdowns?

To examine the relation between private debt booms and real GDP, I start by identifying private debt boom events at the country level as periods when private debt-to-GDP, $d_{it}^P$, is high relative to its previous trend. Specifically, following the approach suggested by Hamilton (2018), I estimate the time series regression

$$d_{it+h}^P = \alpha + \sum_{j=0}^{4} \beta_j d_{it-j}^P + u_{it+h}$$

separately for each country $i$ in the sample, setting $h = 4$. Denoting the predicted value from this regressions as $\hat{d}_{it}^P$, the Hamilton filtered value of debt-to-GDP is then $\tilde{d}_{it}^P = d_{it}^P - \hat{d}_{it}^P$.

I identify debt booms as periods when the Hamilton filtered debt-to-GDP exceeds 1.64 times its country-specific standard deviation, i.e. when $\tilde{d}_{it}^P \geq 1.64 \cdot \sigma_i(\tilde{d}^P)$. The threshold value of 1.64 is chosen based on the 95th percentile of the standard normal distribution, but the results are robust to using other reasonable thresholds. I then construct a dummy variable, $DebtBoom_{it}$, that equals one in the first year of each debt boom event. In a recent study, Richter, Schularick and Wachtel (2018) use a similar approach to identifying

debt booms.

To trace the predicted dynamics of real GDP around a debt boom, I estimate the following sequence of regressions on the full country-year panel for horizons $h = -5, \ldots, 15$:

$$y_{it-5+h} - y_{it-5} = \alpha_i^h + \beta^h DebtBoom_{it} + \epsilon_{it+h}.$$

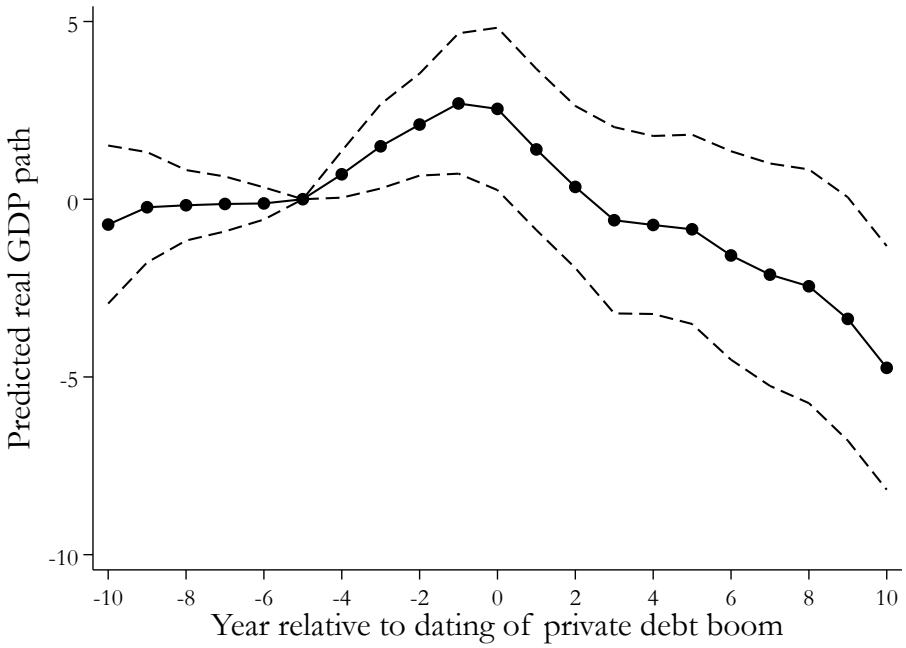
Log real GDP, $y_{it}$, is benchmarked to five years before when the debt boom is identified to allow for a potentially positive impact of the debt boom on contemporaneous GDP. Standard errors are dually clustered on country and year. The sequence of estimated coefficients $\{\hat{\beta}^h\}$ present the average path of real GDP around a private debt boom event, relative to periods without a debt boom.

Figure 3 presents the estimated dynamics of real GDP around a private debt boom event. Note that $t = 0$ marks when the boom is identified, which is often the peak of the boom. However, since debt booms typically last three to four years, the boom generally starts between $t = -3$ and $t = -4$. For example, for the United States in the 2000s, the boom is identified in 2005.

The figure shows that during the debt boom, GDP growth accelerates, and real GDP rises above its trend. However, starting in the year after the boom is identified, real GDP declines sharply by 3 percent over the subsequent three years. Debt booms thus predict lower subsequent real GDP growth. This evidence is consistent with the patterns documented by Mian, Sufi and Verner (2017) for household debt expansions.

In addition to the negative growth impact, Figure 3 also suggests that debt booms predict a lower long-run *level* of output. From three years after the boom is identified, real output is below its previous trend, and output continues to decline for several years after. Ten years after the debt boom, real GDP is 5 percent lower than its previous trend, and the difference is statistically significant. That is, Figure 3 not only suggests that debt booms predict lower future real GDP growth. It also suggests that debt booms lead to a persistently lower *level* of future output.

**Figure 3: Real GDP dynamics around major debt booms**




*Notes*: This figure presents the estimate response of real GDP to a debt boom. Dashed lines represent 95 percent confidence intervals.

In general, estimating the impact debt booms on the long-run level of output is challenging, as the uncertainty rises with the forecast horizon. The large sample I use here helps increase the power for estimating longer-run impacts. However, even with this sample, there is substantial uncertainty in the longer-run estimates. At a minimum, the data show that debt booms certainly do not predict higher output, and there is suggestive evidence that these booms predict a lower level of output.

The suggestive negative impact of debt booms on the subsequent level of output connects the dots between several existing pieces of evidence. Debt booms have been shown to predict lower growth and financial crises (Schularick and Taylor (2012), Mian, Sufi and Verner (2017)). Financial crises, in turn, result in highly persistent or even permanent output losses (Cerra and Saxena (2008), Baron, Verner and Xiong (2018)). The negative relation between debt

booms and subsequent output suggests that increased financial crisis risk is not offset by growth booms following debt booms that do not end in a financial crisis.

At this point, it is important to emphasize an important caveat. Debt booms are not exogenous events. These booms could merely coincide with periods of lower productivity growth, real exchange rate overvaluation, or other contractionary forces. However, most economic models would suggest that debt booms should follow or anticipate stronger economic growth. For example, an expected future productivity shock would lead to a positive relation between credit expansion today and future output growth.[2]

Therefore, while caution is warranted in interpreting debt booms as causally lowering future output (that is, interpreting that debt booms themselves have "costs"), the fact that debt booms do not seem to be positively related to future output raises important questions. In particular, the idea that debt booms are part of beneficial credit deepening is soundly rejected by the data. Credit booms cannot explain the positive relation between economic development and credit depth. Financial development may cause higher income, but it does not operate through debt booms.

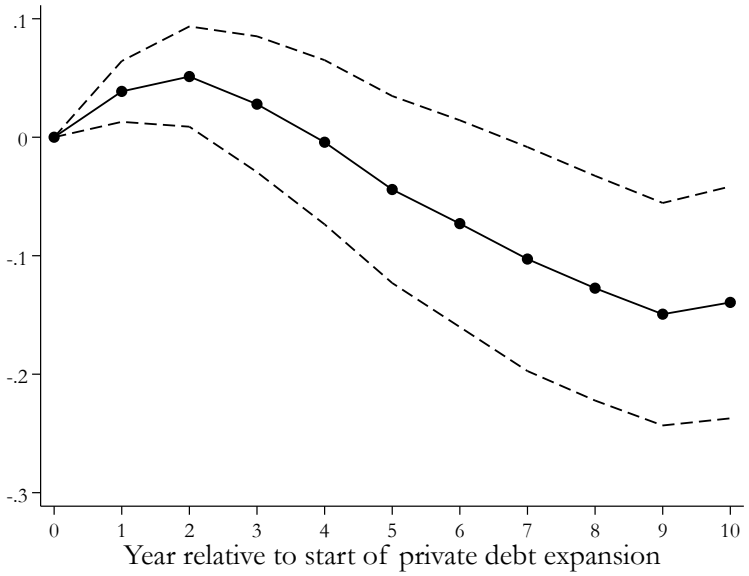
Earlier studies examining the impact of increases in debt-to-GDP on subsequent growth using country-level panel data find a positive relation (e.g., Levine, Loayza and Beck (2000), Loayza and Ranciere (2006)). What explains the sharp difference with the evidence I present here? The earlier panel studies connecting finance and growth typically average data over non-overlapping periods, generally of five years, and estimate dynamic panel models on these averaged data. These models are intended to capture the impact of financial development on steady-state growth. The averaging procedure, therefore, filters away many of the very rapid expansions in credit that constitute credit booms. This is consistent with my thesis. Credit booms, rapid expansions in credit, are associated with lower growth. More gradual expansions in credit

[2]If agents anticipate a growth slowdown or a credit crunch, they may borrow to hoard liquidity. Surveys of professional forecasters and the behavior of stock prices around credit booms, however, suggest that crashes are not anticipated by market participants.

are more benign and may represent beneficial financial deepening.

## 3.2 Robustness

**Figure 4: Real GDP dynamics around private debt expansions**




*Notes*: This figure presents the dynamics of real GDP around private debt expansions, estimated using equation (1). Dashed lines represent 95 percent confidence intervals computed using standard errors that are two-way clustered on country and year.

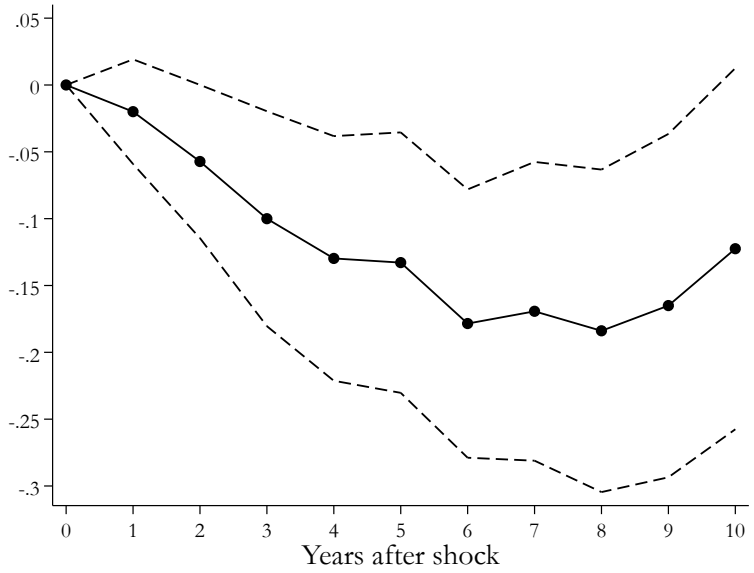
The results in Figure 3 are robust to alternative approaches to trace the impact of debt booms. In particular, the fact that debt booms predict lower subsequent growth is not sensitive to how debt booms are identified. Figure 4 presents estimates of $\beta^h$ from

$$y_{t-3+h} - y_{t-3} = \beta^h \Delta_3 d_t^P + \alpha_i + \epsilon_{it}, \quad h = 1, ..., 10. \tag{1}$$

That is, I fix the right-hand-side to be private credit expansions from year $t-3$ to $t$ and examine the correlation with growth from $t-3$ to $t-2, t-1$,..., and

$t + 7$. I choose a private debt expansion of three-years based on the evidence in Mian, Sufi and Verner (2017) that debt expansions typically last for three to four years. Figure 4 shows that private debt expansions are associated with real GDP expansions in the short run, but a strong reversal in the medium run that translates into a lower subsequent level of output.

**Figure 5: Private debt shocks predict a lower subsequent level of output: Local projection impulse response**




*Notes*: This figure presents the response of real GDP to a private debt-to-GDP shock estimated using Jordà (2005) local projections given by equation (2). Dashed lines represent 95 percent confidence intervals computed using standard errors that are two-way clustered on country and year.

Figure 5 presents the impulse response of real GDP to private debt-to-GDP innovations estimated using Jordà (2005) local projections. Specifically, the figure plots the estimates of $\beta_0^h$ from the following specification:

$$y_{it+h} = \alpha_i + \sum_{j=0}^{5} \beta_j^h d_{it-j}^P + \sum_{j=0}^{5} \delta_j^h y_{it-j} + \epsilon_{it+h}, \quad h = 1, ...10. \tag{2}$$

Figure 5 again suggests that innovations in debt lead to slower growth in the medium run. The local projection impulse response also suggests that debt expansions lead to a lower subsequent level of output.

# 4 Why are debt booms associated with lower future output?

Private debt booms predict lower medium-run growth and perhaps even a lower long-run level of output. Here I outline the key systematic patterns in the data that help understand the destructive impact of private debt booms. Understanding the potential mechanisms also reinforces the hypothesis that debt booms play a causal role in depressing future output, as opposed to merely being a passive reflection of real economic dynamics.

## 4.1 Credit supply expansion

Private debt booms often start with an increased willingness of the financial sector to lend, that is, with an increase in *credit supply*. Credit supply expansion can be driven by a variety of factors. Financial innovation such as securitization may increase the flow of savings toward private credit such as mortgage loans. Banking market liberalization can also drive an expansion in credit supply by increasing competition in the lending market, as, for example, the experience of the Nordic countries during the 1980s demonstrated.

Credit supply can also expand due to an increase in saving, either domestically or from abroad. For many open economies with free capital mobility, credit expansion is often driven by increased global liquidity, which lowers borrowing costs and fuels capital inflows. Increased global liquidity and lower global borrowing costs can, in turn, be driven by loose monetary policy in leading economies (Miranda-Agrippino and Rey (2015)). Credit supply may also rise because of overoptimism that leads lenders to over-extrapolate recent low defaults or neglect downside risk (Minsky (1986), Bordalo, Gennaioli and Shleifer (2018)). Regardless of the underlying source, the expansion in credit

supply explains why credit expands rapidly without merely following faster productivity growth.

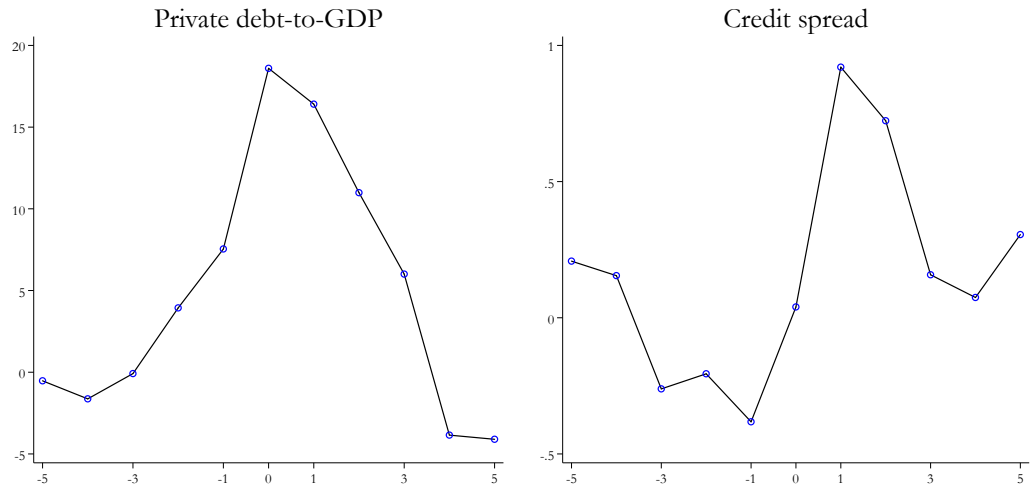
Figure 6 provides evidence of the role of credit supply at the country level. It shows that during private debt booms, credit spreads decline and fall below their trend level. Specifically, it plots the average of the Hamilton-filtered private debt-to-GDP and corporate credit spread around the debt boom events identified in section 3. Credit spreads are measured as the difference between corporate bond yields and the long-term treasury bond yield. This evidence is consistent with Krishnamurthy and Muir (2017), who find that credit spreads tend to be low before financial crises, and Mian, Sufi and Verner (2017), who show that mortgage spreads are low during household credit booms.

In addition to declining spreads, credit supply expansion can also lead to a decline in lending standards and an increase in lending to riskier borrowers. Greenwood and Hanson (2013) document that credit expansions coincide with an increase in the share of bond issuance by risky firms, i.e., the high yield share, which López-Salido, Stein and Zakrajšek (2017) argue captures periods of elevated credit market "sentiment." Building on Greenwood and Hanson (2013), Kirti (2018) presents evidence for a broad sample of countries showing that the high yield share increases during credit expansions. The evidence of declining lending standards provides further support for the view that debt booms are driven by credit supply expansions.

## 4.2 Distortionary demand booms

The expansion in credit supply can affect the economy in two ways. First, it can boost productive capacity by allowing constrained firms to increase investment or improving the allocation of capital across firms. The productive capacity channel is the channel through which credit supply expansion may lead to higher long-run income. Second, it can boost demand by increasing household access to disposable funds. Credit expansion that only operates through demand is unlikely to represent growth-enhancing credit deepening.

**Figure 6: Debt booms are driven by credit supply expansion**




*Notes*: This figure shows the average path of private debt-to-GDP and credit to GDP around private debt boom episodes. Both series are in percentage point deviations from the Hamilton-filtered trend, as described in section 3. The credit spread variable is from a variety of sources combined by Baron, Verner and Xiong (2018).

Mian, Sufi and Verner (2019) present a simple framework to diagnose whether debt booms operate through the demand channel. They show that credit expansions that operate through demand lead to an expansion in non-tradable relative to tradable employment and real exchange rate appreciation. The logic is the following. A credit expansion operating through demand will boost demand for both non-tradable and tradable goods. Tradable goods can be imported, but non-tradable goods must be produced locally. This requires an increase in production of non-tradable goods, leading to a reallocation of employment to the non-tradable sector. Rising demand also increases the price of non-tradables relative to tradables, reflecting the shortage of non-tradable goods. The rise in the relative price of non-tradables fuels a real exchange rate appreciation.

In contrast, Mian, Sufi and Verner (2019) show that credit expansions that operate by expanding the economy's productive capacity do not lead to a re-

allocation toward non-tradables. This is true even if the credit expansion has a differential effect on the non-tradable or tradable sector's access to credit. Moreover, credit expansions that operate through supply also lead to expanding exports, as the economy becomes more productive.

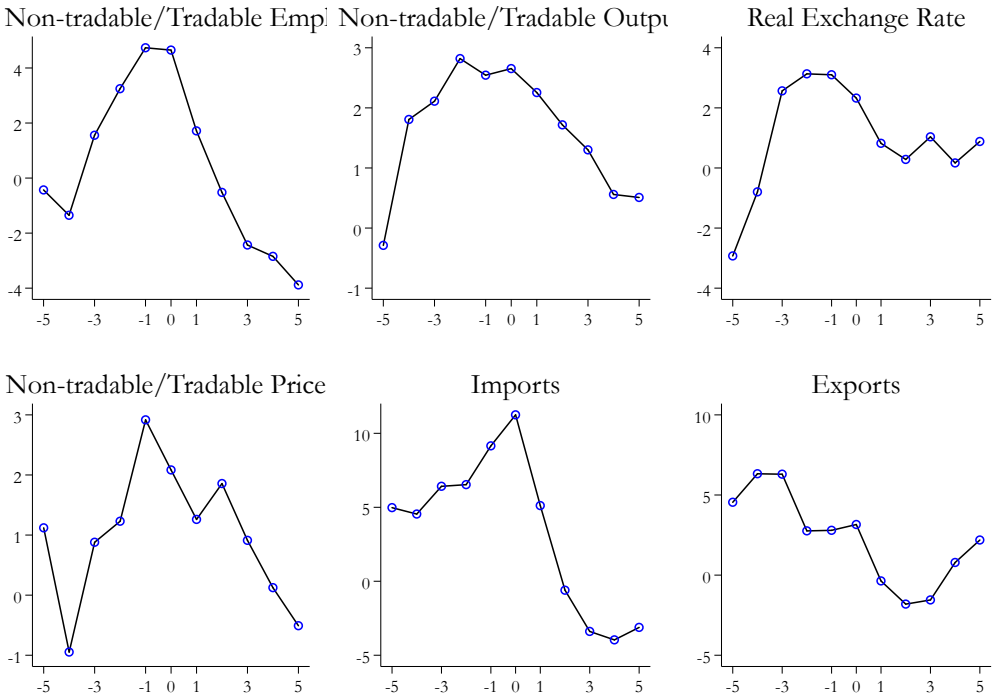
Figure 7 presents evidence that private debt booms fuel demand booms. Non-tradable relative to tradable employment expands during debt booms and then collapses in the busts. Non-tradable to tradable output shows similar dynamics. The reallocation toward non-tradable sectors, including construction, is especially difficult to square with productivity-enhancing effects of debt booms. These sectors have generally seen slower productivity growth than tradable sectors such as manufacturing (Borio et al. (2016)).

Figure 7 also shows that debt booms lead to an appreciation of the real exchange rate and the relative price of non-tradables. The reallocation toward non-tradables coincides with expanding imports, but falling exports, as the tradable sector loses competitiveness. Overall, debt booms appear to operate primarily by boosting demand rather than productive capacity. In the process, these booms create distortions that will exacerbate the subsequent bust.

### 4.3 Credit supply reversal and banking sector troubles

Figure 6 shows that the expansion in credit supply eventually reverses with a spike in credit spreads and a sharp slowdown in lending. The reversal starts in year 0 of the peak and accelerates in year 1 after the peak of the debt boom. Understanding what precipitates the reversal and its exact timing is one of the least well-understood aspects of private debt booms. Professional economic forecasters seldom predict turning points, including recessions. Bordalo, Gennaioli and Shleifer (2018) present a theory of "diagnostic expectations," in which a sequence of negative shocks leads to a sharp reversal from optimism to pessimism, leading to a contraction in credit supply that marks the start of the bust phase of the cycle. These negative shocks are often unexpected losses on loans. For example, in the model of Greenwood, Hanson and Jin (2019), unexpected defaults lead to an excessive cutback in access to credit,

**Figure 7: Debt booms boost demand, not productive capacity**



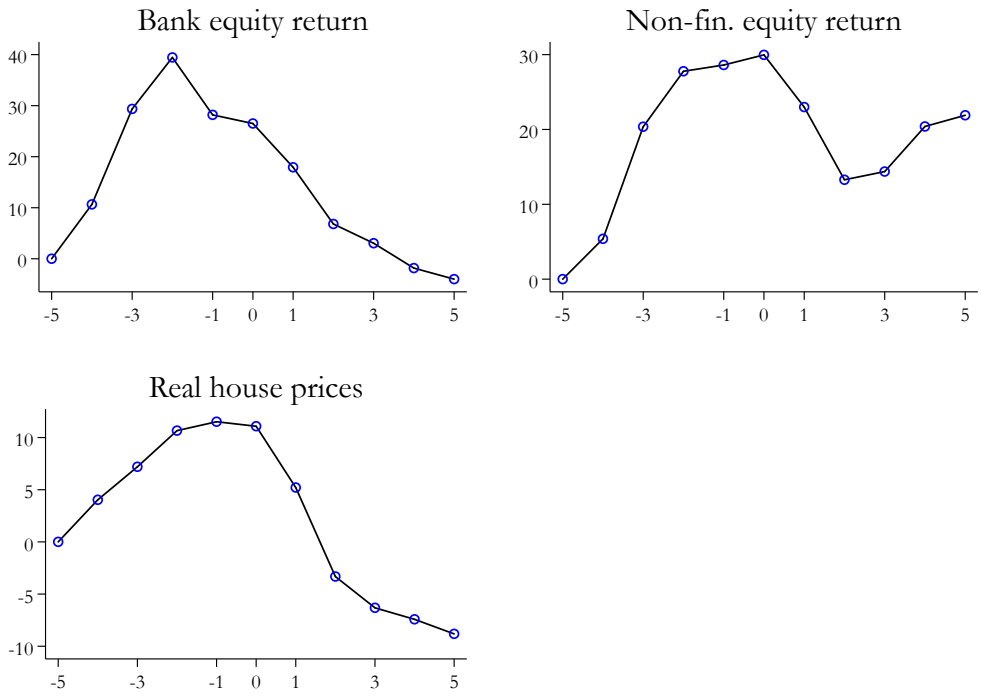

*Notes*: This figure shows the average path of non-tradable relative to tradable employment, output, and prices; the real exchange rate; imports; and exports around private debt boom events identified as described in section 3. All series are percent deviations from the Hamilton filtered trend. Non-tradable and tradable employment, output, and prices are from a variety of sources combined by Mian, Sufi and Verner (2019). The real exchange rate is from the BIS. Imports and exports are from the World Bank's *World Development Indicators*.

as investors over-extrapolate recent losses.

Figure 8 shows that bank equity total returns index peaks and begins declining two years before (year $t = -2$) the peak of the debt boom. In contrast, non-financial equities peak with the peak of the credit boom ($t = 0$). This is consistent with Baron, Verner and Xiong (2018), who find that bank stocks tend to detect banking crises before non-financial equities and credit spreads. Bank equity is a levered portfolio of loans to households and

businesses. The decline in bank equity represents losses on these loans that create banking sector distress. The banking sector distress, whether in the form of a full-blown banking crisis or more quiet banking undercapitalization, translates into a contraction in credit supply that depresses new lending and raises the cost of credit for households and firms. The fall in credit supply directly depresses consumption, investment, and output (e.g., Chodorow-Reich (2014), Huber (2018)).

**Figure 8: Bank equity, non-financial equity, and house prices**




*Notes*: This figure shows the average cumulative bank equity returns, non-financial equity returns, and real house prices around private debt boom events. All series are in log (times 100) deviations from the Hamilton-filtered trend and benchmarked to period $t = -5$, i.e. five years before the peak of the debt boom. Bank and non-financial equity returns are from Baron, Verner and Xiong (2018). Real house prices are from the BIS's *Residential property prices* database, deflated by the consumer price index.

## 4.4 Debt overhang, housing busts, and overvaluation

The contraction in credit supply interacts with several distortions created in the boom phase to produce a sharp slowdown in output. First, the overhang of debt itself from the credit boom acts as an important contractionary force. Elevated debt depresses demand and leads to asset fire sales for distressed borrowers. Drehmann, Juselius and Korinek (2018) show that the real GDP growth slows following debt booms precisely when funds start to flow from borrowers back to lenders due to higher debt service requirements.

Verner and Gyöngyösi (2018) provide direct evidence of the contraction role of higher household debt burdens following a debt boom. They compare borrowers and cities with greater exposure to foreign currency debt relative to domestic currency debt during a currency crisis in Hungary. Cities that experienced larger increases in real debt burdens through foreign currency debt exposure experience a collapse in spending, local employment, and house prices. The rise in foreign currency debt burdens has negative spillover effects on nearby borrowers with only domestic currency debt. This evidence highlights that the negative consequences of debt booms can be especially severe when the boom is financed with risky contracts such as foreign currency loans denominated in funding currencies.

Second, private debt booms fuel unsustainable asset price booms, including house price booms, that then reverse in the bust. During the boom, the expansion in debt is reinforced by rising asset prices that increase collateralized borrowing (Mian and Sufi (2011)). The boom in house prices also reinforces the reallocation of employment toward the non-tradable sector through the increase in construction activity. Figure 8 shows the boom and bust and house prices around private debt booms. Mian and Sufi (2014) estimate how the interaction of high household debt and house price declines depress local demand and employment across U.S. regions in the Great Recession.

Third, the real appreciation created by the demand boom sow the seeds of a more severe slowdown. When the credit supply expansion reverses, the economy is left with higher wages and prices. The fall in demand translates into higher unemployment and lower output because of downward rigidity in

wages (Schmitt-Grohé and Uribe (2016)). Moreover, the economy is left with a bloated non-tradable sector and an uncompetitive tradable sector that is difficult to reverse because of real frictions that make it difficult for workers to transition from non-tradable to tradable sector jobs.

Overvaluation may also have long-term negative effects. Sustained overvaluation may reduce the long-term competitiveness of the tradable sector (Krugman (1987), Rodrik and Subramanian (2009)). As tradable industries lose market share internationally, they also fail to adopt new technologies and improve productivity through learning-by-doing. Overvaluation and the reallocation toward non-tradables can also reduce human capital formation. For example, Charles, Hurst and Notowidigdo (2015) show that 2000s housing boom in the U.S. led many individuals to forego a college education and instead work in the construction sector. Many of these jobs were based on temporarily elevated demand and disappeared when the boom reversed.

## 4.5 The role of household debt and housing

Household debt booms are particularly likely to be lead to lower output growth and increased risk of a financial crisis (Jordà, Schularick and Taylor (2014), Mian, Sufi and Verner (2017)). House price booms have been suggested as one of the best signals for detecting whether a debt boom will end in a financial crisis (Richter, Schularick and Wachtel (2018)). The patterns highlighted above help understand why. Household debt booms are particularly likely to finance demand and real estate booms. While expanding household borrowing can improve welfare by allowing households to smooth consumption, household debt booms are less likely to finance improvements in productive capacity. However, while household debt is important to monitor, bank and firm leverage also matter. The negative consequences of debt busts on the real economy are even more powerful when bank and firm balance sheets are also highly levered (Giroud and Mueller (2016)).

# 5 How do we deal with debt booms?

Private debt booms predict growth slowdowns and an increased risk of a banking crisis. Moreover, as I show, the data suggest that debt booms even predict a lower future real GDP in the long term. The evidence is mounting that the costs of private debt booms are severe, and these costs likely outweigh the benefits.

What, if anything, should policy do about credit booms? On this question, theory is ahead of practice and empirical evidence. Recent theoretical models with macroeconomic and financial frictions show that debt booms can be socially inefficient (e.g., Lorenzoni (2008), Farhi and Werning (2016), Korinek and Simsek (2016)). However, excessive borrowing occurs in equilibrium because borrowers and lenders do not internalize the negative equilibrium consequences of high debt in a crisis. These models imply that it can be optimal for regulators to limit private borrowing during credit booms.

Surely this means there is a major role for macroprudential policy. Not so fast. Macroprudential policies have a role in limiting the most excessive debt booms. However, macroprudential policy cannot be expected to avoid all crises, and these policies have several practical challenges.

The first challenge is that we still have a limited understanding of how macroprudential policies work, and these policies can have unintended consequences. For example, prudential policies targeting one sector, such as housing markets, can increase risk-taking by financial intermediaries in other segments, such as corporate lending, as demonstrated by Acharya et al. (2019). Macroprudential policy may also shift intermediation toward unregulated institutions in the "shadow banking" sector without reducing systemic risk.

The second challenge is that policymakers may also be engulfed by the same overoptimistic expectations spur a risky credit expansion. In many cases, we cannot rely on policymakers being smarter than the market. This challenge applies especially to time-varying macroprudential instruments that aim to time the cycle. Even if policymakers can recognize a build-up of risk, a third challenge is that politicians may not have an incentive to curb credit booms

that boost short-run growth. Müller (2018*b*), for example, shows that macroprudential policy displays an electoral cycle, with policy being loosened prior to elections.

The fourth and perhaps most critical challenge facing macroprudential policy is that assessing their success is close to impossible. How do we know when crises are averted? If macroprudential policies can avert crises for a sustained period, their benefits may be difficult to judge, while their costs in the form of restricted access to credit will be clear. In contrast, for monetary policy, it is much easier to know whether inflation is close to a two percent target. Altogether, these challenges imply that simple macroprudential tools have a role in curbing the worst excesses of debt booms, but macroprudential policy cannot be expected to avoid all crises. A central task of future research is to improve our understanding of whether and how macroprudential tools work.

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# Additional Tables and Figures

**Table 1: Sample**

| Country | Years | Country | Years |
|---|---|---|---|
| Afghanistan | 2006-2016 | Lebanon | 1988-2016 |
| Algeria | 1995-2016 | Lesotho | 1973-2016 |
| Argentina | 1984-2016 | Liberia | 1974-2015 |
| Australia | 1960-2016 | Lithuania | 1995-2016 |
| Austria | 1960-2016 | Madagascar | 1962-2016 |
| Azerbaijan | 1992-2016 | Malawi | 1965-2016 |
| Bahrain | 1980-2015 | Malaysia | 1964-2016 |
| Bangladesh | 1974-2016 | Maldives | 2001-2016 |
| Belgium | 1970-2016 | Mali | 1967-2016 |
| Benin | 1960-2016 | Malta | 1970-2016 |
| Bhutan | 1983-2016 | Mauritania | 1962-2012 |
| Botswana | 1972-2016 | Mexico | 1980-2016 |
| Brazil | 1996-2016 | Mongolia | 1991-2016 |
| Bulgaria | 1991-2016 | Morocco | 1966-2016 |
| Burkina Faso | 1960-2016 | Mozambique | 1988-2016 |
| Burundi | 1964-2016 | Myanmar | 1960-2016 |
| Cambodia | 1993-2016 | Nepal | 1960-2016 |
| Cameroon | 1960-2016 | Netherlands | 1961-2016 |
| Canada | 1960-2016 | New Zealand | 1977-2016 |
| Cape Verde | 1980-2016 | Nicaragua | 1960-2016 |
| Central African Rep. | 1960-2016 | Niger | 1960-2016 |
| Chad | 1960-2016 | Nigeria | 1960-2016 |
| Chile | 1983-2016 | Norway | 1960-2016 |
| China | 1985-2016 | Oman | 1972-2015 |
| Colombia | 1996-2016 | Pakistan | 1960-2016 |

Continued on next page

**Table 1: Sample**

| Country | Years | Country | Years |
|---|---|---|---|
| Comoros | 1982-2016 | Papua New Guinea | 1973-2016 |
| Congo | 1960-2016 | Paraguay | 1960-2016 |
| Costa Rica | 1996-2016 | Peru | 1960-2016 |
| Cote d'Ivoire | 1960-2016 | Philippines | 1960-2016 |
| Croatia | 1995-2016 | Poland | 1992-2016 |
| Cyprus | 1975-2016 | Portugal | 1960-2016 |
| Czech Rep. | 1993-2016 | Qatar | 2000-2016 |
| Dem. Rep. of the Congo | 1963-2016 | Rep. of Korea | 1962-2016 |
| Denmark | 1966-2016 | Rep. of Moldova | 1995-2016 |
| Djibouti | 1990-2015 | Romania | 1996-2016 |
| Dominica | 1977-2016 | Russian Federation | 1995-2016 |
| Dominican Rep. | 1991-2016 | Rwanda | 1964-2016 |
| Ecuador | 1960-2016 | Saint Lucia | 1977-2016 |
| Egypt | 1960-2016 | St. Vincent | 1975-2016 |
| El Salvador | 1965-2016 | Samoa | 1982-2016 |
| Eritrea | 1995-2011 | Sao Tome and Principe | 2000-2016 |
| Estonia | 1995-2016 | Saudi Arabia | 1993-2016 |
| Ethiopia | 1981-2008 | Senegal | 1960-2016 |
| FS Micronesia | 1995-2016 | Serbia | 1997-2016 |
| Finland | 1970-2016 | Sierra Leone | 1960-2016 |
| France | 1969-2016 | Singapore | 1970-2016 |
| Gambia | 1966-2014 | Slovakia | 1995-2016 |
| Georgia | 1995-2016 | Slovenia | 1995-2016 |
| Germany | 1970-2016 | Solomon Isds | 1990-2016 |
| Ghana | 1960-2016 | South Africa | 1965-2016 |
| Greece | 1970-2016 | Spain | 1970-2016 |
| Grenada | 1977-2016 | Sri Lanka | 1961-2016 |

Continued on next page

**Table 1: Sample**

| Country | Years | Country | Years |
|---|---|---|---|
| Guatemala | 1960-2016 | Sudan | 1960-2016 |
| Guinea | 1989-2016 | Sweden | 1961-2016 |
| Guinea-Bissau | 1990-2016 | SwitzeArland | 1980-2016 |
| Guyana | 1960-2016 | Thailand | 1970-2016 |
| Haiti | 1996-2016 | Togo | 1960-2016 |
| Honduras | 1960-2016 | Tonga | 1981-2016 |
| Hungary | 1991-2016 | Trinidad and Tobago | 1960-2016 |
| India | 1960-2016 | Turkey | 1986-2016 |
| Indonesia | 1976-2016 | USA | 1960-2016 |
| Iran | 1961-2016 | Uganda | 1982-2016 |
| Ireland | 1971-2016 | Ukraine | 1995-2016 |
| Israel | 1990-2016 | United Arab Emirates | 1975-2016 |
| Italy | 1960-2016 | United Kingdom | 1963-2016 |
| Jamaica | 1966-2016 | Tanzania | 1988-2016 |
| Japan | 1964-2016 | Uruguay | 1960-2016 |
| Jordan | 1975-2016 | Vanuatu | 1979-2016 |
| Kazakhstan | 1995-2016 | Venezuela | 1960-2014 |
| Kenya | 1961-2016 | Viet Nam | 1992-2016 |
| Kuwait | 1965-2016 | Yemen | 1990-2013 |
| Kyrgyzstan | 1995-2016 | Zambia | 1965-2016 |
| Lao People's Dem. Rep. | 1989-2010 | Zimbabwe | 1979-2005 |
| Latvia | 1995-2016 | | |

*Notes*: This table presents the countries and years used in the country level analysis. The range of years represents the intersection of the years available for the key variables, which is the sample used in the analysis.