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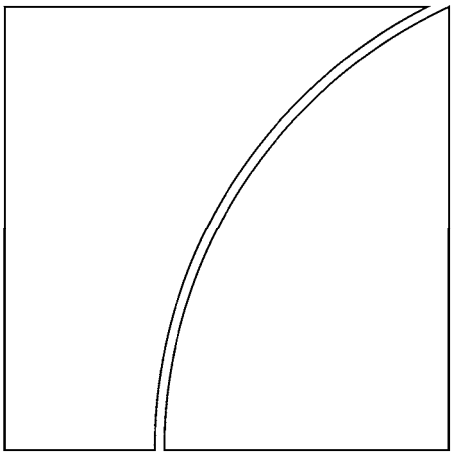

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by Stephen G Cecchetti, M S Mohanty and Fabrizio Zampolli

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The real effects of debt

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Abstract

At moderate levels, debt improves welfare and enhances growth. But high levels can be damaging. When does debt go from good to bad? We address this question using a new dataset that includes the level of government, non-financial corporate and household debt in 18 OECD countries from 1980 to 2010. Our results support the view that, beyond a certain level, debt is a drag on growth. For government debt, the threshold is around 85% of GDP. The immediate implication is that countries with high debt must act quickly and decisively to address their fiscal problems. The longer-term lesson is that, to build the fiscal buffer required to address extraordinary events, governments should keep debt well below the estimated thresholds. Our examination of other types of debt yields similar conclusions. When corporate debt goes beyond 90% of GDP, it becomes a drag on growth. And for household debt, we report a threshold around 85% of GDP, although the impact is very imprecisely estimated.

JEL classification: D9, H3, H6, O4

Keywords: Growth, public debt, private debt, debt threshold, ageing

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1. Introduction

Debt is a two-edged sword. Used wisely and in moderation, it clearly improves welfare. But, when it is used imprudently and in excess, the result can be disaster. For individual households and firms, overborrowing leads to bankruptcy and financial ruin. For a country, too much debt impairs the government's ability to deliver essential services to its citizens.

High and rising debt is a source of justifiable concern. We have seen this recently, as first private and now public debt have been at the centre of the crisis that began four years ago. Data bear out these concerns – and suggest a need to look comprehensively at all forms of non-financial debt: household and corporate, as well as government. Over the past 30 years, summing these three sectors together, the ratio of debt to GDP in advanced economies has risen relentlessly from 167% in 1980 to 314% today, or by an average of more than 5 percentage points of GDP per year over the last three decades. Given current policies and demographics, it is difficult to see this trend reversing any time soon. Should we be worried? What are the real consequences of such rapid increase in debt levels? When does its adverse impact bite?

Finance is one of the building blocks of modern society, spurring economies to grow. Without finance and without debt, countries are poor and stay poor. When they can borrow and save, individuals can consume even without current income. With debt, businesses can invest when their sales would otherwise not allow it. And, when they are able to borrow, fiscal authorities can play their role in stabilising the macroeconomy. But, history teaches us that borrowing can create vulnerabilities. When debt ratios rise beyond a certain level, financial crises become both more likely and more severe (Reinhart and Rogoff (2009)). This strongly suggests that there is a sense in which debt can become excessive. But when?

We take an empirical approach to this question. Using a new dataset on debt levels in 18 OECD countries from 1980 to 2010 (based primarily on flow of funds data), we examine the impact of debt on economic growth. Our data allow us to look at the impact of household, non-financial corporate and government debt separately.[2] Using variation across countries and over time, we examine the impact of the movement in debt on growth.[3]

Our results support the view that, beyond a certain level, debt is bad for growth. For government debt, the number is about 85% of GDP. For corporate debt, the threshold is closer to 90%. And for household debt, we report a threshold of around 85% of GDP, although the impact is very imprecisely estimated.

Our result for government debt has the immediate implication that highly indebted governments should aim not only at stabilising their debt but also at reducing it to sufficiently low levels that do not retard growth. Prudence dictates that governments should also aim to keep their debt well below the estimated thresholds so that even extraordinary events are unlikely to push their debt to levels that become damaging to growth.

Taking a longer-term perspective, reducing debt to lower levels represents a severe test for the advanced economies. Here, the challenge is compounded by unfavourable demographics. Ageing populations and rising dependency ratios have the potential to slow

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[2] Flow of funds data should provide a more accurate picture of indebtedness than bank credit data, which exclude several forms of debt including securitised debt, corporate bonds and trade credit. The difference is likely to matter in countries such as the United States, where a large fraction of credit is granted by non-bank intermediaries.

[3] Recent empirical studies of the effect of public debt on growth using panel data include Checherita and Rother (2010) and Kumar and Woo (2010). Unlike these studies, ours investigates the impact on growth of household and non-financial corporate debt too.

growth as well, making it even more difficult to escape the negative debt dynamics that are now looming.

The remainder of the paper is organised in four sections. In Section 2, we discuss why we believe that high levels of debt create volatility and are bad for growth. Formal models of this phenomenon are still at very early stages, so all we can offer is some intuition. We go on, in Section 3, to a preliminary examination of the data and the main facts about the build-up of non-financial sector debt in advanced economies. Section 4 contains our main empirical results. These are based on a series of standard growth regressions, augmented with information about debt levels. It is here that we report our estimates of the thresholds beyond which debt becomes a drag on growth. Section 5 discusses these results in the context of the inescapable demographic trends. Section 6 concludes.

2. Why debt matters

For a macroeconomist working to construct a theoretical structure for understanding the economy as a whole, debt is either trivial or intractable. Trivial because (in a closed economy) it is net zero – the liabilities of all borrowers always exactly match the assets of all lenders. Intractable because a full understanding of debt means grappling with a world in which the choice between debt and equity matters in some fundamental way. That means confronting, among other things, the intrinsic differences between borrowers and lenders; non-linearities, discontinuities, and constraints in which bankruptcy and limits on borrowing are key; taxes, where interest paid to lenders is treated differently from dividends paid to shareholders; differences between types of borrowers, so household, corporate and government debt are treated separately; and externalities, since there are times when financial actors do not bear (or are able to avoid) the full costs of their actions.

As modern macroeconomics developed over the last half-century, most people either ignored or finessed the issue of debt. With few exceptions, the focus was on a real economic system in which nominal variables – prices or wages, and sometimes both – were costly to adjust. The result, brought together brilliantly by Michael Woodford in his 2003 book, is a logical framework where economic welfare depends on the ability of a central bank to stabilise inflation using its short-term nominal interest rate tool. Money, both in the form of the monetary base controlled by the central bank and as the liabilities of the banking system, is a passive by-product. With no active role for money, integrating credit in the mainstream framework has proven to be difficult.[4]

Yet, as the mainstream was building and embracing the New Keynesian orthodoxy, there was a nagging concern that something had been missing from the models. On the fringe were theoretical papers in which debt plays a key role, and empirical papers concluding that the quantity of debt makes a difference.[5] The latest crisis has revealed the deficiencies of the mainstream approach and the value of joining those once seen as inhabiting the margin.

In response to the challenge, macroeconomists are now working feverishly to put financial stability policy on the same theoretical footing that exists for conventional monetary policy. They are working not only to understand the sources of systemic risk, but also on how to

[4] Indeed, there has been little significant progress in modelling financial frictions and credit since the model of the financial accelerator of Bernanke et al (1999).

[5] See eg Friedman (1987), Kiyotaki and Moore (1997) and Borio et al (2001).

measure it and mitigate it.[6] That means writing down models in which debt truly matters and working through the implications.

Like a cancer victim who cannot wait for scientists to find a cure, policymakers cannot wait for academics to deliver the synthesis that will ultimately come. Instead, authorities must do the best they can with the knowledge they have. As they make their day-to-day policy decisions, central bankers, regulators and supervisors need some understanding of the role of debt in the economy. When is debt excessive? When should we worry about its level, growth rate and composition?

Starting with the basics, once one begins thinking about fixed non-state-contingent obligations – bonds, loans and the like – things get very complicated very fast. Why are loans and bonds by far the most prevalent mechanism for shifting resources over time? Why aren't risks shared more equally among the various parties? And, when investors finance a boom, why is it exclusively through this contractual form? The answers to these very important questions are probably related to information asymmetries and tax treatment.[7] But rather than getting bogged down, we simply note that the basic form of debt has remained remarkably constant both over history and across countries, empires and legal systems.

As for its uses, borrowing allows individuals to smooth their consumption in the face of a variable income. It allows corporations to smooth investment and production in the face of variable sales. It allows governments to smooth taxes in the face of variable expenditures.[8] And it improves the efficiency of capital allocation across its various possible uses in the economy. At least in principle, it should also shift risk to those most able to bear it.

And public debt, in particular, can help smooth consumption not only through the lifetime of individuals who are currently alive, but also across generations. To the extent that future generations will be richer than the current ones – because they will have a combination of more human capital and more productive technology – a transfer from future to current generations can raise society's intertemporal welfare.[9] Since part of the tax rise needed to fund higher current consumption is postponed, public debt may rise, at least up to a point, without growth necessarily slowing. Furthermore, government debt also provides liquidity services, which can contribute to easing the credit conditions faced by firms and households, thus crowding in private investment.[10]

For all these reasons, financial deepening and rising debt go hand in hand with improvements in economic well-being.[11] Without debt, economies cannot grow and macroeconomic volatility would also be greater than desirable.[12]

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6 A prominent recent example is Woodford (2011).

7 For a discussion of the basics of information asymmetries, see Cecchetti and Schoenholtz (2011). On taxes, see Myers (2001).

8 See Barro (1979).

9 See Cukierman and Meltzer (1989) for a formal model in which agents cannot leave negative bequests to their children on their own, so they vote to raise public debt. The argument in favour of a backward intergenerational transfer is strengthened if part of government debt is financing investment that will benefit future generations. However, it is important to note that the model in Cukierman and Meltzer (1989) is deterministic: agents who maximise their as well as their offspring's welfare know with certainty what their future income will be. In reality, the risk that future generations' income might turn out less than expected should play an important role in restraining the rise in government debt.

10 See Woodford (1990).

11 Arguably, an increase in government debt may not necessarily be welfare-improving. Part of the observed increase in public debt in industrial countries can also be ascribed to the common revenue pool problem: those members of society that benefit from additional spending are not the same as those bearing the extra cost of funding it. Even so, to the extent that costly tax increases are postponed, the increase in government

But financial development is not some magic potion. The accumulation of debt involves risk. As debt levels increase, borrowers' ability to repay becomes progressively more sensitive to drops in income and sales as well as increases in interest rates. For a given shock, the higher debt, the higher is the probability of defaulting. Even for a mild shock, highly indebted borrowers may suddenly no longer be regarded as creditworthy. And when lenders stop lending, consumption and investment fall. If the downturn is bad enough, defaults, deficient demand and high unemployment might be the grim result. The higher the level of debt, the bigger the drop for a given size of shock to the economy. And the bigger the drop in aggregate activity, the higher the probability that borrowers will not be able to make payments on their non-state-contingent debt. In other words, higher nominal debt raises real volatility, increases financial fragility and reduces average growth.[13]

Hence, instead of high, stable growth with low, stable inflation, debt can mean disruptive financial cycles in which economies alternate between credit-fuelled booms and default-driven busts. And, when the busts are deep enough, the financial system collapses, taking the real economy with it.

In principle, as highly indebted borrowers stop spending, less indebted borrowers or lenders could take up the slack. For example, wealthy households could purchase goods at reduced prices and cash-rich firms could invest at improved expected return. But they need not. As Eggertson and Krugman (2011) point out, it is the asymmetry between those who are highly indebted and those who are not that leads to a decline in aggregate demand. Those authors suggest that, in order to avoid high unemployment and deflation, the public sector should borrow to fill the spending gap left by private sector borrowers as the latter repair their balance sheets.[14]

But, while the argument put forward by Eggertson and Krugman (2011) is correct in principle, even the capacity of the public sector to borrow is not unlimited. When a crisis strikes, the ability of the government to intervene depends on the amount of debt that it has already accumulated as well as what its creditors perceive to be its fiscal capacity – that is, the capacity to raise tax revenues to service and repay the debt. Fiscal authorities may become constrained both in their attempt to engage in traditional countercyclical stabilisation policies and in their role as lender of last resort during a financial crisis.[15] That is, high levels of public debt can limit essential government functions.[16]

It is important to note that there is a clear interaction between public and private debt. As we have seen during the recent crisis, when private borrowing has fiscal backing, default

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debt may, up to a point, not have an immediate negative impact on growth. (For an overview of the common revenue pool problem, see eg Eichengreen et al (2011).)

[12] See the survey in Levine (2005).

[13] See Bernanke and Gertler (1990) for an early example of a full general equilibrium model based on this intuition.

[14] Despite the lack of satisfactory formal models, central banks have been aware for some time of the importance of the distribution of debt and wealth across the economy, both for the conduct of monetary policy and for its financial stability implications. For an examination of the role of the distribution of household debt in the United States, see eg Dynan and Kohn (2007); and for a discussion of the role of household debt in the United Kingdom, see eg Benito et al (2007) and Waldron and Zampolli (2010b).

[15] Aghion et al (2011) find evidence that industries that rely more heavily on external finance or hold less tangible assets tend to grow faster in OECD countries that implement more countercyclical fiscal policies.

[16] When examining the effects of the stock of debt on growth, it is also important to consider the potential interaction between the stock and flow of credit. The burden of debt and the risks associated with it depend on the stock of accumulated debt. Knowing this, both lenders and borrowers may begin to restrain the future flow of credit after the stock of debt has passed some critical point. A diminished flow of credit may, in turn, hamper growth.

increases public debt. And the ability of the public sector to sustain a given level of debt depends on its ability to raise revenue or its fiscal capacity – something that could become compromised if the private sector is already highly indebted.

Our conclusion is that, at low levels, debt is good. It is a source of economic growth and stability. But, at high levels, private and public debt are bad, increasing volatility and retarding growth. It is in this sense that borrowing can first be beneficial, so long as it is modest. But beyond a certain point, debt becomes dangerous and excessive. We now turn to a description of trends in industrial country debt before moving to the empirical analysis, in which we look for the turning point.

3. Rising debt: a preliminary examination

The past three decades have witnessed a remarkable rise in advanced country indebtedness. In this section, we briefly review trends in household, non-financial corporate and government debt. In what follows, we will refer to the total combined debt of these three sectors as the *total non-financial debt*.[17]

Trends in aggregate non-financial sector debt

Graph 1 shows the aggregate non-financial sector debt of advanced economies and its composition since 1980.[18] Two facts stand out: first, total non-financial debt as a percentage of GDP, as well as its sectoral components, have been rising steadily for much of the past three decades (left-hand panel). Starting at a relatively modest 167% of GDP three decades ago, total non-financial debt has reached 314% of GDP. Of this increase, governments account for 49 percentage points, corporates for 42 percentage points, and households for the remaining 56 percentage points.

The right-hand panel of Graph 1 shows an index of debt adjusted for inflation, offering a slightly different perspective of debt evolution. Even adjusting for inflation does not change the message: real corporate debt has risen by a factor of roughly 3 (an average annual compounded growth rate of 3.8%); government debt by about 4½ times (5.1% annual rate); and household debt by 6 times (6.2% annual rate). Overall, real debt of the non-financial sector in advanced economies has been growing steadily at a rate of slightly less than 4½% for the past 30 years.

What these panels show is that the surge in non-financial debt preceding the recent crisis is not a new phenomenon. It is merely the continuation of a trend that was ongoing over the entire period for which we have been able to assemble comprehensive data – a trend that was also accompanied by significant changes in composition.

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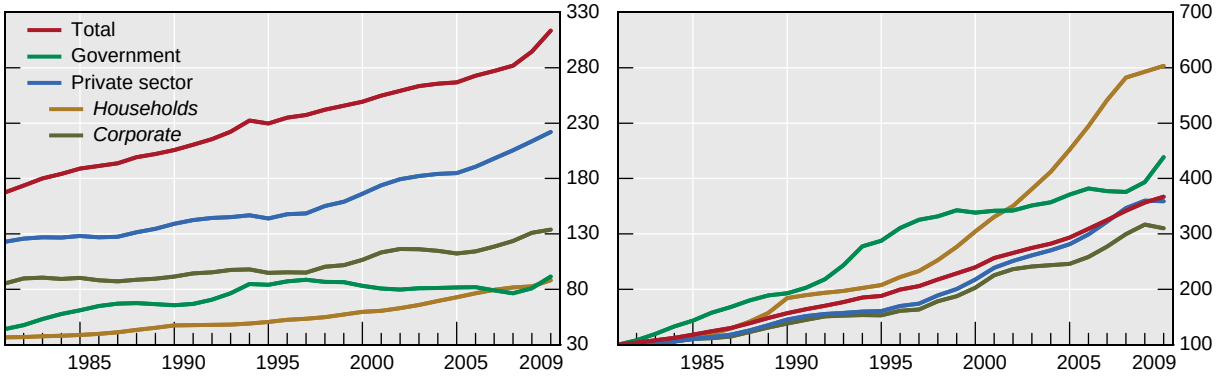
[17] Ideally, we would prefer to measure either a stock relative to a stock or a flow divided by a flow. The former, a conventional measure of leverage like the ratio of total assets to debt, would require data on assets. And the latter, like a measure of debt burden to income, would require us to have data on debt servicing. Unfortunately, the limits of available data precluded both of these approaches.

[18] In what follows, we use the public sector to refer to the "general government" sector, and the private sector corresponds to "non-financial corporations" and "households". As a consequence, non-financial corporate sector debt includes the debt of public non-financial corporations, which are controlled by governments but are market producers. Household debt includes debt of non-profit institutions serving households. See Appendix 1 for more details.

Graph 1

Non-financial sector debt

As a percentage of GDP[1] | Real levels, deflated by consumer prices[2]



[1] Simple averages for 18 OECD economies. [2] Rebased to 1980 = 100; simple average of 16 OECD economies, including the United States.

As shown in Graph 1, from 1995 to the middle of the last decade, public debt had been relatively stable as a percentage of GDP. But this period of relative public sector restraint was accompanied by a rapid rise in household and non-financial corporate debt. The right-hand panel of Graph 1 makes the rather stark point that real household debt tripled between 1995 and 2010, dwarfing the accumulation of debt in other sectors of the economy.

Table 1 provides a country breakdown of the simple and GDP-weighted averages plotted in Graph 1.[19] These data show that the build-up of total non-financial debt is not a development confined to a few large economies. Instead, it is a common feature across the 18 countries in our sample. Total non-financial debt now exceeds 450% of GDP in Japan, 350% in Belgium, Portugal and Spain, and 300% in two thirds of the countries.

Although countries share a similar upward trend in total debt, there are differences. In many European ones, corporate debt makes up more than 40% of the total. (In Belgium, Finland, Norway, Spain and Sweden, corporate debt is more than half of the total non-financial debt.) In others, households account for the largest share. Australia, Denmark and the Netherlands are examples. While in Japan, Italy and Greece, it is public debt that is dominant. Our sense is that both the level and composition of debt should matter for growth, something we examine below.

One clear limitation of our dataset is that it starts in 1980. It is sufficient, however, to look back at the history of the United States (for which long back data are easily available) to understand how extraordinary the developments over the last 30 years have been. As Graph 2 shows, the US non-financial debt-to-GDP ratio was steady at around 150% from the early 1950s until the mid-1980s. In some periods, public debt was high, but then private debt was low; while in others it was the reverse.[20] Since the mid-1980s, however, both public and private debt have been moving up together.

[19] Appendix 2 contains tables reporting a breakdown of total non-financial debt into its components: government, non-financial corporate and household.

[20] See Friedman (1981 and 1986) for a discussion.

Table 1
Household, corporate and government debt as a percentage of nominal GDP

	Levels				Changes[2]		
	1980	1990	2000	2010[1]	1980–90	1990–2000	2000–10
United States	151	200	198	268	49	–2	70
Japan	290	364	410	456	75	46	46
Germany	136	137	226	241	1	89	15
United Kingdom	160	203	223	322	43	20	99
France	160	198	243	321	37	45	78
Italy	109	180	252	310	71	72	58
Canada	236	278	293	313	42	15	20
Australia	128	174	185	235	46	11	49
Austria	162	178	205	238	16	27	32
Belgium	170	264	298	356	94	34	58
Denmark			259	336			77
Finland	146	173	222	270	26	49	48
Greece	92	139	195	262	47	55	67
Netherlands	205	265	294	327	60	29	33
Norway			256	334			78
Portugal	144	141	251	366	–2	110	115
Spain	172	187	258	355	15	70	97
Sweden	219	289	320	340	70	31	21
Total of above							
Median	160	192	251	322	45	40	58
Weighted average[3]	172	218	246	306	47	28	61
Simple average	168	211	255	314	43	44	59
G7	177	223	264	303	45	41	55
Other advanced	160	201	249	321	41	46	61
Memo: Std deviation	*50*	*64*	*54*	*43*			

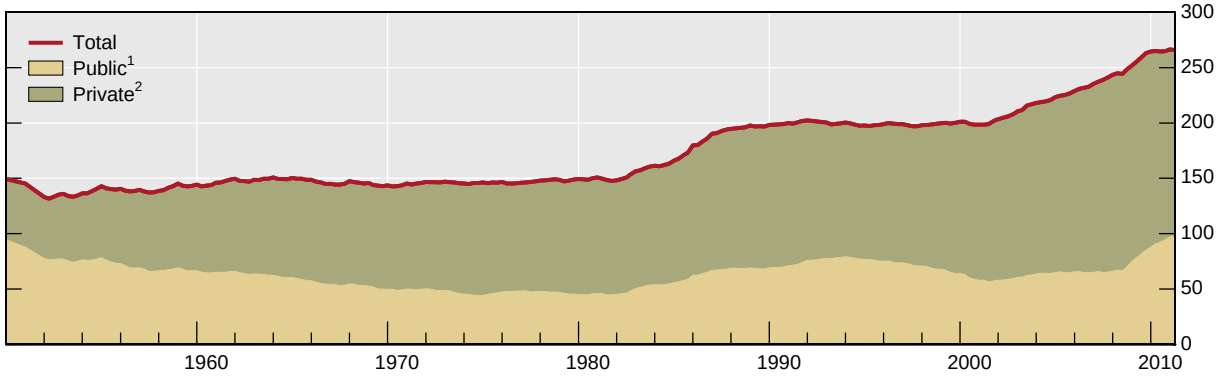
[1] Some figures refer to 2009. [2] In percentage points of GDP. [3] Based on 2005 GDP and PPP exchange rates.

Sources: OECD; national data, authors' estimates.

Graph 2

Outstanding debt of US non-financial borrowers

As a percentage of GDP



[1] Sum of federal government and state and local governments. [2] Sum of household and non-financial business.

Sources: Board of Governors of the Federal Reserve System; Friedman (1981).

Why has debt been rising so steadily?

What can then explain the trend in non-financial debt in advanced economies? The relentless accumulation of non-financial debt has coincided with some important institutional

and market developments. First, from the late 1970s onwards, restrictions on financial market activity and lending had been progressively and systematically removed, increasing opportunities to borrow. Combined with improvements in financial theory and information technology, this liberalisation has led to an intensification of financial innovation. The ability to price complex financial products is indeed a prerequisite for fabricating and selling them.

Second, starting in the mid-1980s and continuing until the start of the recent crisis, the macroeconomic environment had grown more stable. The Great Moderation brought lower unemployment rates, lower inflation rates and less uncertainty. Believing the world to be a safer place, borrowers borrowed more, lenders lent more – and inflation remained low. There was also a likely feedback here: as financial innovation improved the stability of credit supply and allowed risk to flow to those best able to bear it, it improved general economic stability.[21]

Third, since the mid-1990s, the substantial decline in real interest rates has made it easier to support ever higher levels of debt.[22] The reasons behind such reduction are controversial. The most prominent hypothesis is that low long-term interest rates are a consequence of a high preference for saving in emerging markets – a preference that arose for a variety of reasons, including a poor social safety net, ageing populations' retirement needs, and a desire for insurance after the East Asian financial crisis of the late 1990s.[23]

Finally, tax policies may have played a role, if not in explaining the rapid rise in debt, at least in making the level of debt higher than it would have been otherwise.[24] For instance, the preferential treatment of interest payments encourages firms to issue debt – a factor that could be behind the rising corporate indebtedness we see in some countries. It may also play a role in the rise in household debt, where generous tax relief for mortgage interest payments, along with explicit subsidies and implicit guarantees, could have played a role in expanding home ownership in some places.[25]

Regardless of the cause, the consequences are clear. Over the past 30 years, debt has risen relentlessly across the industrial world. Looking at the simple average, total non-financial debt rose by 147 percentage points of GDP from 1980 to 2010. Of this, 38% (56 percentage points) was accounted for by households, 29% (42 percentage points) was a consequence of additional corporate borrowing, and a third (49 percentage points) represents increases in public debt.

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[21] See Cecchetti et al (2005) for a summary of factors that accounted for the Great Moderation. Dynan et al (2006) focus on the role of financial innovation.

[22] Waldron and Zampolli (2010a) investigate the effect of demographic changes and of a reduction in the real interest rate on house prices and household debt in a quantitative overlapping-generations model calibrated to the UK economy.

[23] This is also known as the global saving glut hypothesis (Bernanke (2005), Bernanke et al (2011)). In its latest incarnation, the hypothesis includes not only high saving rates but also a dearth of investment opportunities as a possible explanation for low global real interest rates. This is why researchers normally refer to "excess" or "net" savings, to emphasise the gap between saving and investment that opened up in a number of countries (see eg Obstfeld and Rogoff (2009)). For a critical view of the global saving glut hypothesis, see eg Borio and Disyatat (2011) and Shin (2009), both of which favour an explanation based on the procyclical behaviour of financial institutions' leverage. See also Modigliani and Cao (2004), who argue that the high saving rate experienced by China is not due to a different preference for saving but is mainly a phenomenon driven by that country's high growth rate.

[24] See eg Keen et al (2010).

[25] Demographic changes in some advanced countries may also have contributed in the last few decades to boosting household debt. Typically, the demand for housing is higher among middle-aged households. Thus housing demand, and hence household debt, may have risen with the baby boom generation going through middle age (as well as higher immigration rates and the continued rise in the number of households due to higher divorce rates, etc). Yet demographic explanations in support of house prices are not new and they are suspicious. They have been used in the past to justify unjustifiable housing booms. See eg Akerlof and Shiller (2010).

4. The impact of debt on economic growth

Debt has been rising for decades, and economies have been growing. And, with high levels of debt, policymakers are counting on robust growth to ensure sustainability. Without rising GDP, there will be no way to raise the revenues governments need to reduce their exploding debts. But now, debt is rising to points that are above anything we have seen, except during major wars. Have we come to the point where debt levels are so high that they are harming medium- and long-term growth?

We now turn to an empirical investigation of this question, starting with some simple statistics concerning the macroeconomic link between debt and growth, and then run some more sophisticated panel regressions in an effort to detect the impact of debt on growth.

Preliminary evidence

We examine annual data on GDP per capita and the stock of non-financial sector debt for a group of 18 OECD countries over the period 1980–2006.[26] The novelty of our dataset is the inclusion of private debt for a large number of industrial countries as well as its breakdown into non-financial corporate and household debt. Since we are interested in trend growth, we choose to end our sample in 2006, the year prior to the beginning of the latest financial crisis.

Table 2

Correlation of debt with annual per capita GDP growth

Total non-financial debt	–0.0199***
	(0.000)
Government debt	0.0026
	(0.594)
Private debt	–0.0197***
	(0.000)
Corporate debt	–0.0204***
	(0.000)
Household debt	–0.0254***
	(0.004)

The table reports simple correlations, computed using ordinary least squares, of the annual per capita growth rate with various definitions of debt. Asymptotic p-values for the test that the correlation is equal to zero are in parentheses. */**/*** indicate correlations significantly different from zero at the 10/5/1% level.

Source: Authors' calculations.

We begin by looking at the relationship between debt and growth, in terms of both level and volatility. Table 2 reports correlations based on bivariate least squares regressions of annual per capita GDP growth on various measures of aggregate non-financial debt. Table 3 reports equivalent results for the (overlapping) standard deviation of the five-year-ahead growth rate

[26] The countries in our dataset are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States. All debt series begin in 1980 – with the exception of the household debt series of Denmark and Norway. Appendix 1 describes in detail how the dataset has been constructed.

of per capita GDP, a measure of aggregate volatility.[27] In both cases, we include country and time-period fixed effects.

Starting from Table 2, we see that there is a negative within-country (or time-series) correlation between growth and total non-financial debt. Looking at the details, we see that both non-financial corporate and household debt display a statistically and economically significant negative correlation with growth. For corporate debt, a 1 percentage point increase is associated with an approximately 2 basis point reduction in per capita GDP growth. For household debt, the impact is even larger: a 1 percentage point rise in household debt-to-GDP is associated with a 2½ basis point reduction in growth.[28]

Turning to Table 3, we see that public debt has no statistically (or economically) significant relationship with the future volatility of aggregate growth. But, for corporate plus household debt combined, a 10 percentage point increase in debt leads to an increase in the standard deviation of future growth of about 0.10 percentage points. Corporate debt, rather than household debt, appears to be driving this result.

Table 3

Correlations of per capita GDP volatility with debt

Total non-financial debt	0.0042
	(0.331)
Government debt	–0.0057
	(0.301)
Private debt	0.0103***
	(0.007)
Corporate debt	0.0102**
	(0.036)
Household debt	0.0156
	(0.293)

The regressions are panel regressions with both country and period fixed effects. The dependent variable is the standard deviation of future annual growth rates of per capita GDP over the following five years. Observations are overlapping, so robust standard errors are reported. Debt variables are shares of GDP. Numbers in parentheses are asymptotic p-values for the test that the coefficient estimate is equal to zero computed using standard errors estimated using the Huber-White sandwich estimator. */**/*** indicate coefficient estimates significantly different from zero at the 10/5/1% level.

Source: Authors' calculations.

These results are somewhat surprising, as we do not believe that debt in the generally low range found in our sample is uniformly bad for growth. There are a variety of explanations for this simple correlation. The most obvious is that simple correlations are masking the effects of other common influences. With that in mind, we turn to an analysis based on somewhat more sophisticated growth regressions.

[27] That is, for each period *t* we compute the standard deviation of the annual growth rates of per capita GDP for period *t+1*, *t+2*, … and *t+5*.

[28] We also ran these regressions using an estimator that is robust to the presence of outliers. In all cases, the association with growth is slightly less strong but remains both statistically and economically significant. Dropping fixed country and time effects from the regressions generally leads to a non-significant relationship between growth and measures of debt. Using five-year-ahead averages of per capita growth instead of annual observations leaves these conclusions largely unchanged.

Growth regressions: the model

Our empirical strategy proceeds in two steps. First, we specify and estimate a growth equation based on the empirical growth literature (eg Barro and Sala-i-Martin (2004)). Then we add various measures of non-financial debt to see whether they have an impact on growth over and above other determinants.

The empirical specification is derived from the neoclassical growth model of Solow, in which per capita income growth depends on the initial level of physical and human capital, converging to its steady state rate slowly over time. In turn, the steady state depends positively on the saving rate and negatively on the growth rate of the labour force, in addition to a number of parameters describing the technology and the preferences of the country.

Earlier empirical studies of growth focused on regional or cross-country differences. Here, instead, we follow Islam (1995) and others in estimating panel data regressions with country-specific fixed effects (as well as time-specific fixed effects). This allows us to measure the impact of a change in one factor on growth *within* a country.[29]

Another important aspect of our empirical analysis is that we use overlapping five-year forward averages of the per capita income growth rate. The use of five-year averages, common in the growth literature, reduces the potential effects of cyclical movements and allows us to focus on the medium-term growth rate.[30]

Turning to the details, we model the growth rate of per capita income for country *i* as:

$$\bar{g}_{i,t+1,t+k} = -\phi y_{i,t} + \beta' X_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t,t+k}, \quad (1)$$

where

$$\bar{g}_{i,t+1,t+k} = \frac{1}{k}\sum_{j=t+1}^{t+k} g_{i,j} \cong \frac{1}{k}\left(y_{i,t+k} - y_{i,t}\right)$$

is the k-year forward average of annual growth rates between year $t+1$ and $t+k$ and y is the log of real per capita GDP. In our analysis, we set k=5. The regressors in equation (1) include: the log of real per capita GDP at time t (to capture the "catch-up effect" or conditional convergence of the economy to its steady state); a set of other regressors, X, thought to explain growth; country-specific dummies, μ_i; time-specific dummies meant to capture common effects across time, γ_t (eg global business cycle conditions that will affect all countries and so on); and residuals ε.

It is important to note that, in order to minimise the potential for the endogeneity bias (and the problem of reverse causation), all regressors (with the exception of the population growth rate) on the right-hand side of (1) are predetermined with respect to the five-year forward average growth rate. Furthermore, the overlapping nature of the data imparts a moving-

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[29] Our choice of looking at within-country or time effects is essentially dictated by the relatively small number of countries in our database (N=18), which precludes a sensible analysis of cross-country differences. But using panel data with fixed effects also has considerable advantages. Indeed, it is possible to control for unobservable differences between countries using simple dummies, provided such heterogeneity is assumed to be constant over time. For example, countries may differ in terms of their legal and institutional system, culture, religions, etc. While these characteristics are difficult to measure, to the extent that they do not change over time they will be captured by country-specific dummies.

[30] We use overlapping observations both to increase efficiency and to avoid what would be the arbitrary construction of five-year non-overlapping blocks. Indeed, one common practice is to take five-year averages over 1980–84, 1985–89, 1990–94, and so forth. However, there is no reason why one cannot choose different periods, eg 1982–86, 1987–91, etc. Given that we use overlapping averages of five years forward and that our sample ends in 2006, our last observation is 2001. We note that overlapping data are also used by Bekaert et al (2001, 2005) in their study of the effects of financial liberalisation on economic growth.

average process to the errors, so that we use a robust procedure to compute the standard errors of our coefficient estimates.[31]

The list of regressors in our specification includes:

- gross saving (public and private) as a share of GDP;
- population growth;
- the number of years spent in secondary education, a proxy for the level of human capital;[32]
- the (total) dependency ratio as a measure of population structure and ageing;
- openness to trade, measured by the absolute sum of exports and imports over GDP;
- CPI inflation, a measure of macroeconomic stability;
- the ratio of liquid liabilities to GDP, as a measure of financial development;[33] and
- a control for banking crises taking the value of zero if in the subsequent five years (as identified by Reinhart and Rogoff (2008)) there is no banking crisis, and the value of 1/5, 2/5, and so forth, if a banking crisis occurs in one, two, etc, of the subsequent five years.

Before turning to the results, two additional points are worth emphasising. First, given the difficulty of measuring the physical capital stock and the link that should exist between capital and income, one can also interpret the log of real per capita GDP on the right-hand side of (1) as a proxy for physical capital. And second, related to the crisis variable, we note that high levels of debt for a country as a whole or for one of its sectors may be a reason why a country may end up facing a banking crisis. But it may also be the reason why a given downturn, originating from events outside the country or the indebted sector, may turn out to

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[31] The presence of the log real GDP among the regressors makes (1) a dynamic fixed-effects panel data model. This means that, in principle, the estimates from using the least squares dummy variable (LSDV) estimator may be biased. Starting with Nickell (1981), several researchers have shown that the coefficient on the lagged dependent variable is biased downwards even if N (the number of units in the panel) goes to infinity. The estimates are, however, consistent in T (the time dimension of the panel), with the bias of the order O(1/T). A number of alternative estimators to the LSDV have been proposed in the literature to overcome the finite sample bias. These are based on the instrumental variable estimation (Anderson and Hsiao (1981)) or generalised method of moments (GMM) (Arellano and Bond (1991), Arellano and Bover (1995)). Yet instrumental-variable (IV) and GMM techniques normally work well when the number of panel units is large and the time dimension small. These techniques are also subject to drawbacks which do not make them suitable for application to the typical macroeconomic panel data with moderate N and T. First, IV estimators are generally less efficient than ordinary least squares (OLS). Second, instrumental variables may only be weakly correlated with the instrumented variables. As a result of this, estimates obtained through IV techniques may also be biased and tests of hypothesis may have low power (Stock et al (2002)). Most importantly, Monte Carlo simulations show that even for moderate sample size of T=30 and N=20 – the typical size of a macroeconomic panel – the LSDV estimator performs as well as or better than the instrumental variable estimators (Judson and Owen (1999)). In our case, N=18 and T=25. We therefore follow the suggestion of Judson and Owen (1999) and use the LSDV estimator.

[32] We also tried to include life expectancy at birth and fertility rates as potential proxies for human capital, but these variables turn out to be largely irrelevant in our sample of advanced economies when we control for the other determinants of growth.

[33] We also experimented with other measures of financial depth, such as stock market capitalisation (as constructed by the World Bank; see Beck et al (2000) and Beck and Demirgüç-Kunt (2009)). Stock market capitalisation has some explanatory power, but unfortunately it is available only from 1989 for most countries. We also experimented with the flow of private credit to GDP and the flow of public borrowing to GDP (constructed as the change in the stock of debt divided by GDP) – for further details see below.

be worse than it could have been otherwise. Using this variable thus allows us to check whether or not the effects of debt on growth are related to periods of financial stress.[34]

Growth regressions: the estimates

Table 4 reports our basic growth regression, along with summary statistics for the variables included. As noted above, the presence of overlapping data imparts serial dependence in the country-specific residuals, so we use a robust procedure to estimate the standard errors of the estimated coefficients in (1).[35]

All coefficients have the expected sign and are in most cases statistically significantly different from zero at conventional levels. The size of the coefficients also conforms to those reported in earlier studies. In particular, the rate of convergence is approximately 15% a year, consistent with what is found in prior panel data studies. The saving rate has a positive effect on growth, although imprecisely estimated. (The precision increases when we add the debt variables.[36]) Furthermore, consistent with the theory, the change in the population has a negative (albeit imprecisely estimated) impact on growth. And, as we expect, banking crises are associated with lower growth. The estimates imply that, for each additional year spent in crisis, average growth falls by an average of 27 basis points over the proceeding five years.[37]

Before moving on, we note that the dependency ratio has a strongly negative and statistically significant impact on subsequent growth. Our estimates imply that a one standard deviation increase in the total dependency ratio – an increase of roughly 3.5 percentage points – is associated with a 0.6 percentage point reduction of future average annual growth.

Growth regressions: the impact of debt

We now add the debt variables to these regressions. The results are in Table 5. The top panel reports the results of the model that controls for banking crisis, while the middle and bottom panels examine two important variants on this. Starting at the top, the first five columns show the consequences of adding one variable at a time, while the remaining five columns report the results for various combinations. The tables in Appendix 3 report the full details of the regressions, including estimated coefficients for the control variables.

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[34] We also attempted to control for the size of the country, as proxied by the log of its population, and for the size of government, as proxied by government consumption as a share of GDP. These variables generally turn out to be statistically insignificant when most of the other regressors are included. Moreover, their inclusion or exclusion has no noticeable effects on the other regression coefficients.

[35] Specifically, we employ the Huber (1967)-White (1980) sandwich estimator. In the computation of the robust standard errors, observations are clustered by country (Rogers (1993)). We find that the standard errors computed using this procedure are much larger than the ordinary ones, indirectly confirming the presence of heteroskedasticity and time dependence in the estimated residuals. We also computed Newey-West standard errors, but these turn out to be smaller even when specifying an autocorrelation lag as large as 10 (which should take care of the moving-average structure imparted by the overlapping nature of the observations plus any other additional autocorrelation inherent in the choice of our empirical specification).

[36] Table A3.1 in Appendix 3 shows how the estimates of the coefficients change as debt variables are added to the basic growth model. Tables A3.2 and A3.3 show how the regressions change as financial flow variables are added to the model or as the crisis variable is dropped, respectively.

[37] The variable in the regression takes the value of 1/5, 2/5, and so forth, if a banking crisis occurs in one, two, etc, of the subsequent five years. So, if there is a crisis in one year, then we multiply the coefficient –0.0134 by 0.2, which gives 0.0027, or 27 basis points.

Table 4

Basic growth regression

Variables		Summary statistics	
	Coefficient	Mean	Standard deviation
Dependent variable:			
Five-year forward mean growth rate of per capita GDP		0.0210	0.0119
Independent variables:			
National gross saving (as a share of GDP)	0.0409 (0.131)	0.2193	0.0447
Change in population	–0.4482 (0.233)	0.0050	0.0038
Schooling	0.0051*** (0.001)	8.8262	1.8540
Log of real per capita GDP	–0.1565*** (0.000)	10.1601	0.2521
Trade openness	0.0311** (0.019)	0.6203	0.2922
Inflation rate	–0.0049 (0.787)	0.0471	0.0476
Total dependency ratio	–0.1955*** (0.000)	0.5015	0.0342
Liquid liabilities (as a share of GDP)	0.9935 (0.170)	0.0075	0.0035
Banking crisis	–0.0134*** (0.000)	0.1616	0.2936

Reported coefficients are for the marginal impact of debt on the five-year forward average per capita growth rate from estimating text equation (1). Numbers in parentheses are asymptotic p-values for the test that the coefficient estimate is equal to zero computed using standard errors estimated using the Huber-White sandwich estimator. */**/*** indicate coefficient estimates significantly different from zero at the 10/5/1% level.

Source: Authors' calculations.

Looking at these estimates, two facts stand out. First, total non-financial debt has a negative impact but the p-value is a relatively large 0.177. Second, when we disaggregate debt, we see that public debt has a consistently significant negative impact on future growth. And, the impact is big: a 10 percentage point increase in the ratio of public debt to GDP is associated with a 17–18 basis point reduction in subsequent average annual growth. For corporate and household debt, estimates are very imprecise, so we are unable to come to any real conclusions.

To see whether there are specific factors driving the results in the top panel of Table 5, we examine two alternatives. First, in the middle panel of Table 5 we drop the banking crisis variable in an effort to see whether the effects of debt depend on periods of financial stress. Government debt continues to be negatively associated with subsequent growth, although the effect is generally slightly smaller. But, the remarkable fact from the middle panel of Table 5 is that corporate debt is now negatively related to future growth. Specifically, when

corporate debt is added on its own (column 4), the effect of corporate debt on growth is negative and economically large (an 8 basis point decline per 10 percentage point increase),

Table 5

Effect of debt on future growth

Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Controlling for banking crises										
Total	–0.0078 (0.177)									
Government		–0.0167*** (0.007)				–0.0180** (0.011)	–0.0174*** (0.009)	–0.0175*** (0.008)	–0.0180** (0.010)	
Private sector			0.0016 (0.824)			–0.0023 (0.701)				
Corporate				0.0006 (0.938)			–0.0030 (0.629)		–0.0023 (0.745)	0.0008 (0.916)
Household					0.0050 (0.716)			–0.0033 (0.789)	–0.0027 (0.821)	0.0047 (0.717)
Not controlling for banking crises										
Total	–0.0116** (0.025)									
Government		–0.0164** (0.025)				–0.0169** (0.032)	–0.0191*** (0.006)	–0.0136* (0.093)	–0.0165** (0.030)	
Private sector			–0.0054 (0.279)			–0.0093** (0.046)				
Corporate				–0.0082 (0.163)			–0.0117** (0.028)		–0.0109* (0.058)	–0.0078 (0.194)
Household					0.0023 (0.870)			–0.0043 (0.756)	–0.0013 (0.923)	0.0055 (0.709)
Including financial flow variables										
Total	–0.0103* (0.051)									
Government		–0.0208*** (0.000)				–0.0240*** (0.000)	–0.0226*** (0.001)	–0.0218*** (0.000)	–0.0240*** (0.000)	
Private sector			0.0030 (0.597)			–0.0051 (0.300)				
Corporate				0.0027 (0.689)			–0.0043 (0.459)		–0.0054 (0.377)	0.0023 (0.756)
Household					0.0065 (0.554)			–0.0047 (0.632)	–0.0041 (0.675)	0.0057 (0.610)

Reported coefficients are for the marginal impact of debt on the five-year forward average per capita growth rate from estimating text equation (1). Numbers in parentheses are asymptotic p-values for the test that the coefficient estimate is equal to zero computed using standard errors estimated using the Huber-White sandwich estimator. */**/*** indicate coefficient estimates significantly different from zero at the 10/5/1% level.

Source: Authors' calculations.

but fairly imprecise (with a p-value of 0.16). However, when we control for government debt (column 7), the impact is strongly large and precisely estimated: a 10 percentage point increase in corporate debt is associated with a reduction in subsequent average growth of 11–12 basis points (and the p-value is 0.028). These findings suggest that corporate debt

makes growth worse during periods of financial stress. The fact that the impact is stronger when we control for government debt means that high levels of private debt, in the presence of large government debts, make the economy more vulnerable to shocks.[38]

Finally, we check to see if the outstanding levels of public and private debt are capturing the effects that high debt might have on the future flow of credit and, through this channel, on growth. To do this, we add the average flow of private credit and government borrowing (always as a share of GDP) to the regressions. The results are reported in the bottom panel of Table 5. The existence of what might be termed the "crowding-out" effect, whereby higher debt reduces the future availability of credit, is confirmed by separate regressions, in which – controlling for both country and period fixed effects – we find (not reported here) that higher levels of both public and private debt are negatively associated with future credit flows.

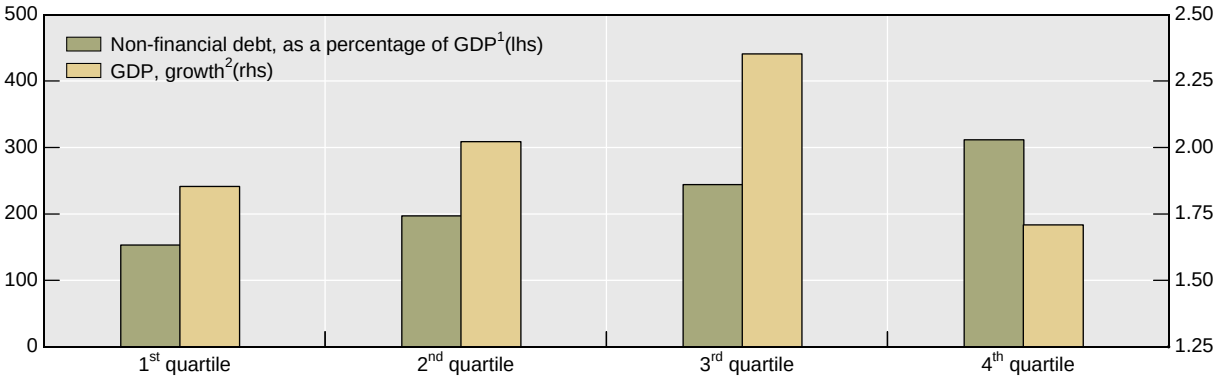
As for the consequences for the level of debt itself, the object of our primary interest, controlling for the credit flow variables makes the estimated effects of total non-financial debt and government debt larger (in absolute value) and more precise.

Threshold effects

In our preliminary discussions, we noted the possibility that, as it increases, indebtedness can turn from good to bad – from initially growth-enhancing (or neutral) to eventually growth-reducing. Our interest is in looking for this effect in the data. We do this first by looking at a simple picture and then at some statistical results.

Graph 3

Non-financial sector debt and output growth for 18 OECD countries



[1] The average of the quartiles. [2] Average growth within the quartiles.

Sources: OECD; Penn World Tables 7.0.

The picture is in Graph 3. We have split the sample of observations on per capita GDP growth based on the distribution of the debt-to-GDP ratio. Mean per capita GDP growth rises as we move from the first to the third quartiles and then falls back in the fourth quartile. Moreover, the difference between growth in the bottom and the top quartiles is small, so

[38] We also added government consumption as a share of GDP to the regressions in order to check whether the effects of public debt would change. If government consumption has a negative impact on growth, then omitting it may lead us to incorrectly conclude that public debt has a negative impact over and above the effects of distortionary taxation and other disincentives imposed on the private sector, which might be proxied by government consumption. It turns out that government consumption is always statistically insignificant in our growth regressions. We also dropped the saving rate variable to check whether debt has a negative impact on growth through capital accumulation. The estimates are little changed.

there is no evidence that debt is necessarily bad for growth. Indeed, for sufficiently low levels, debt may help foster capital deepening and allocative efficiency, thus boosting growth. Yet the graph also suggests that, as debt approaches high levels, the effect of further increases in debt on growth may begin to subside.[39] Although the graph suggests that there is no big difference between high- and low-debt economies in terms of mean growth, it might be that more sophisticated statistical techniques are needed to bring out any larger negative effect on growth from high debt.

Turning to the regression, we ask whether the relationship between growth and debt is non-linear. We look for this using the following empirical model, which incorporates threshold effects but is otherwise identical to equation (1):

$$\overline{g}_{i,t+1,t+k} = -\phi y_{i,t} + \beta' X_{i,t} + \lambda_{-} d_{i,t} I\left(d_{i,t} < \tau\right) + \lambda_{+} d_{i,t} I\left(d_{i,t} \geq \tau\right) + \mu_i + \gamma_t + \varepsilon_{i,t,t+k}\,, \qquad (2)$$

where *I*(.) is an indicator variable that takes the value of 1 if debt is below a given threshold, τ, and zero otherwise. The indicator variable has the effect of splitting the debt variable into two, allowing for the impact to differ above and below the threshold.

We look for threshold effects by including one debt variable at a time in equation (2). To estimate the threshold, we estimate equation (2) for a series of values of debt-to-GDP and then select the one that minimises the sum of squared residuals. To examine the statistical significance of the estimated threshold, we can then use a likelihood ratio (LR) statistic, computed as the difference between the sum of squared residuals of the model for a generic value of the threshold and the sum of squared residuals corresponding to the estimated threshold (scaled by the variance of the sample residuals).[40]

We can illustrate how this procedure works for the case of public debt in the model with the crisis variable. (In the absence of the threshold, this is the case reported in column 2 of the top panel of Table 5.) Graph 4 reports the results for the LR statistic in this case. By definition, this statistic equals zero at the estimated threshold level. The graph shows that 96% of GDP is the point estimate of the threshold level. At the 1% confidence level, the threshold level lies between 92 and 99% of GDP – that is, the level at which we estimate that public debt starts to be harmful to growth may be as low as 92% of GDP and as high as 99% (using 5% or 10% confidence levels would not change the interval much).

Table 6 reports results from estimating this threshold model for government, corporate and household debt separately, with and without the crisis variable. Focusing on the results where we do not control for crises, we estimate the threshold for government debt at 84% of GDP. And, when government debt rises to this level, an additional 10 percentage points of GDP drives trend growth down by some 10–15 basis points.

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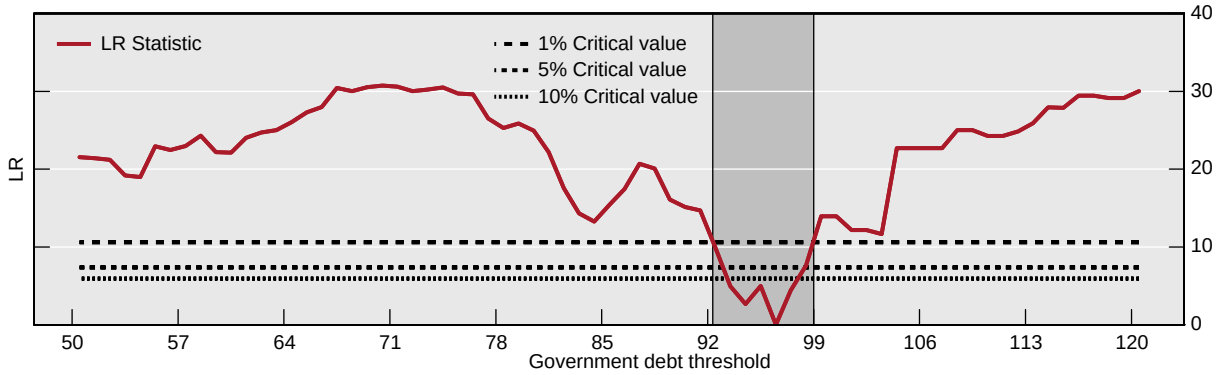
[39] The results are mostly unaltered when we use the median instead of the mean debt and growth values. We also split the annual observations using the debt brackets employed by Reinhart and Rogoff (2010) in their recent analysis of public debt and growth. Using a different dataset, which covers 20 advanced economies over 1946–2009, they find that over the 90% threshold public debt tends to be associated with much lower GDP growth than at lower levels: GDP growth is about 1 percentage point lower at the median and almost 4 percentage points lower at the mean compared with the lowest debt burden group (debt ratios less than 30% of GDP) (see their Figure 2). By contrast, in our sample and using the same brackets for the debt-to-GDP ratio as Reinhart and Rogoff (2010), we do not find any significant differences in either the mean or median growth. Our sample, however, is much more limited than theirs: it starts from a much later date and excludes the latest financial crisis; it covers two countries fewer; and it uses GDP per capita growth rather than GDP growth, and general government debt rather than central government debt.

[40] Hansen (1999) has developed threshold regression methods for non-dynamic panel data models with fixed effects. Since we are not aware of well established methods to estimate threshold effects in dynamic panel data models, we follow his suggested inference methods.

Graph 4

Likelihood ratio statistic



The LR statistic is constructed as $LR(\tau) = (SSR(\tau) - SSR(\hat{\tau}))/\hat{\sigma}^2$, where $\hat{\tau} = \arg\min SSR(\tau)$; SSR is the sum of squared residuals obtained by estimating text equation (2) for different values of the threshold variable.

Before continuing, it is worth noting that the impact of public debt on growth could in part reflect the quality of government. That is, poor governments do a number of things that slow their economies, and debt is a consequence. We note, however, that because we include country fixed effects, it would have to be a deterioration in the quality of governance that was responsible. Unfortunately, we have found no straightforward way of controlling for bad government.[41]

Turning to corporate debt, and again focusing on the results where we do not control for banking crises, we find two thresholds. One is around 75% and the second is close to 90%.[42] Our estimate is that there is a range – between the two thresholds – over which accumulation of corporate debt is relatively neutral. But once that debt reaches the higher of the thresholds, there is a negative impact on growth. The coefficients suggest, however, that the economic impact is in the order of half that for government debt.

Finally, there is household debt. The results suggest that we have pushed the data to the limit. While we find a threshold of 84%, and that the impact of household debt on growth is first positive and then negative, our estimates lack statistical precision. In fact, the p-values for the test of whether the coefficients are zero is nearly one half. So, while we may believe that there is a point beyond which household debt is bad for growth, we are unable to reliably estimate that point using the historical record available to us.

[41] One possibility would be to use the size of government itself, on the reasonable assumption that bad government leads to bloated public expenditure. However, well run societies may well opt for larger governments. Corruption measures seem more promising. For example, Kaufmann (2010) provides intriguing evidence that industrial countries' budget deficits over the period 2006–09 were negatively associated with measures of perceived corruption. We leave further examination of this issue for future research.

[42] We compute the threshold point estimates sequentially. We first look for multiple minima in the sum of squared residuals of the estimated model. If we find more than one minimum, we fix the first point and repeat the search for a new point that minimises the sum of squared residuals, and so forth.

Table 6

Threshold effects

	Threshold estimate	Coefficients		
Government debt				
Controlling for crises	96%	<96%	>=96%	
		–0.0065	–0.0138***	
		(0.232)	(0.004)	
Not controlling for crises	84%	<84%	>=84%	
		–0.0074	–0.0133*	
		(0.382)	(0.057)	
Corporate debt				
Controlling for crises	73%	<73%	>=73%	
		0.0119	0.0047	
		(0.156)	(0.474)	
Controlling for crises (2 threshold points)	73%; 99%	<73%	>=73% & <99%	>=99%
		0.0055	–0.0019	0.0038
		(0.151)	(0.399)	(0.208)
Not controlling for crises (2 threshold points)	73%; 88%	<73%	>=73% & <88%	>=88%
		0.0041	–0.0044	–0.0059**
		(0.221)	(0.260)	(0.041)
Household debt				
Controlling for crises	84%	<84%	>=84%	
		0.0069	–0.0065	
		(0.618)	(0.658)	
Not controlling for crises	84%	<84%	>=84%	
		0.0049	–0.0115	
		(0.733)	(0.458)	

Reported threshold estimates are obtained by minimising the sum of squared residuals in text equation (2). Reported coefficients are for the marginal impact of debt on the five-year forward average per capita growth rate from estimating text equation (2). Numbers in parentheses are asymptotic p-values for the test that the coefficient estimate is equal to zero computed using standard errors estimated using the Huber-White sandwich estimator. */**/*** indicate coefficient estimates significantly different from zero at the 10/5/1% level.

Source: Authors' calculations.

5. Prospects and challenges

Several industrial countries already have debt levels that, according to the empirical evidence presented in the previous section, might be growth-damaging. Or, they soon will be.

As we noted in a previous paper (Cecchetti et al (2011)), public debt ratios are currently on an explosive path in a number of industrial countries. To prevent further deterioration, these countries will need to implement drastic policy changes that reduce current deficits, as well as future contingent and implicit liabilities. Yet stabilisation might not be enough, especially if it is at a level high enough to damage growth.

Unfortunately, the unprecedented acceleration of population ageing that many industrial countries now face may make this task even more difficult. First, ageing drives government

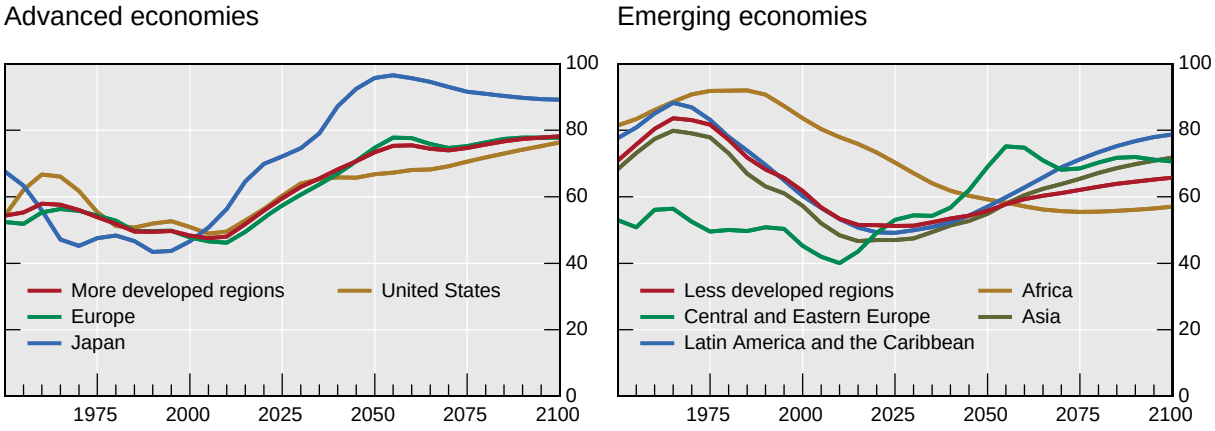
expenditure up and revenue down, directly worsening debt. But, as our results in the previous section suggest, there is an additional effect: rising dependency ratios put further downward pressure on trend growth, over and above the negative effects of debt.

Graph 5 reports dependency ratios, measured as the young and old in society (the non-working-age population) as a percentage of the working-age population, for advanced and emerging market economies. The left-hand panel of the graph shows that a majority of industrial countries are now close to a turning point similar to the one experienced by Japan in the early 1990s. After having declined and remained relatively stable, total dependency ratios will increase rapidly in these countries over the next few decades.

Emerging market economies are also ageing. But, with the exception of Central and Eastern Europe, they lag advanced economies by at least two to three decades. This means that these economies will continue to enjoy a *demographic dividend*: as they catch up with richer economies, their young workforces should continue to support strong growth and saving.

Graph 5

Total dependency ratio[1]



[1] Non-working-age population as a percentage of working-age population.

Source: United Nations, *World Population Prospects*, 2010 revision.

Recent studies have combined the implications of current fiscal deficits with the estimates of future increases in health and pension spending in an effort to project public debt to 2040. While they differ in their optimism, these studies all show that, under unchanged fiscal policy, debt-to-GDP ratios will explode in all but a few countries.[43]

The consequences are striking. Debt quickly rises to more than 100% of GDP – a level clearly consistent with negative consequences for growth. And, in a number of countries – Japan, the United Kingdom and the United States – the projections rise much further. In the euro area, the public debt ratio will also rise, albeit less rapidly than in the UK or US, reflecting the fact that many countries face only a modest rise in the future costs of ageing.

In addition to putting further pressures on public finances, ageing itself might also reduce per capita growth, making it potentially even more difficult for a country to sustain a given level of debt. With unchanged public policies, the ever greater amount of resources that will be channelled to the elderly through pension and health care spending will increase. Furthermore, older people save less than people in younger age groups. The exact timing at

[43] See eg Auerbach (2011), Cecchetti et al (2011), Gagnon (2011) and IMF (2011).

which saving might be reduced and the impact on real interest rates are controversial, depending on public policies and saving in the emerging world, among other things.[44, 45]

That said, the fact that ageing is asynchronous around the world may help more advanced and highly indebted countries to smooth the consequences. There are at least three reasons for that. First, immigration can partly slow the shrinking of labour forces in advanced economies. Second, as incomes and wealth rise, emerging economy savings may continue to flow to countries with more advanced financial markets and lower-risk assets, keeping interest rates down and permitting their capital stocks to grow.[46] And finally, trade may also reduce the need for more radical changes in the composition of demand that ageing might otherwise bring with it.

Such benefits of globalisation should help countries adopt the necessary reforms needed to reduce their public debt while at the same time helping the private sector – through the abundance of the supply of savings and the continuous low real interest rates globally – to do the necessary post-crisis balance sheet repair.

6. Conclusions

While the attention of policymakers following the recent crisis has been on reducing systemic risk stemming from a highly leveraged financial system, the challenges extend beyond that. Our examination of debt and economic activity in industrial countries leads us to conclude that there is a clear linkage: high debt is bad for growth. When public debt is in a range of 85% of GDP, further increases in debt may begin to have a significant impact on growth: specifically, a further 10 percentage point increase reduces trend growth by more than one tenth of 1 percentage point. For corporate debt, the threshold is slightly lower, closer to 90%, and the impact is roughly half as big. Meanwhile for household debt, our best guess is that there is a threshold at something like 85% of GDP, but the estimate of the impact is extremely imprecise.

A clear implication of these results is that the debt problems facing advanced economies are even worse than we thought. Given the benefits that governments have promised to their populations, ageing will sharply raise public debt to much higher levels in the next few decades. At the same time, ageing may reduce future growth and may also raise interest rates, further undermining debt sustainability. So, as public debt rises and populations age, growth will fall. As growth falls, debt rises even more, reinforcing the downward impact on an already low growth rate. The only possible conclusion is that advanced countries with high debt must act quickly and decisively to address their looming fiscal problems. The longer they wait, the bigger the negative impact will be on growth, and the harder it will be to adjust.

It is important to note that our finding of a threshold for the effects of public debt on growth does not imply that authorities should aim at stabilising their debt at this level. On the

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[44] In theory, ageing has an ambiguous effect on capital intensity. The reduction of labour forces might increase capital-to-labour ratios. Indeed, some studies suggest that ageing at the global level will continue to put downward pressure on global real interest rates for many years to come (see eg Attanasio et al (2007) and Krueger and Ludwig (2007)). On the other hand, with unchanged policies, the need to finance ever larger age-related spending may lead to a shortage of capital, which would put upward pressure on real interest rates (see eg Fehr et al (2005)).

[45] Ageing may also adversely affect asset prices. For example, a recent study by Takáts (2010) finds that ageing may have a negative impact on house prices.

[46] On emerging markets' demand for safe assets, see Caballero et al (2008) and Caballero (2010). More generally on the ex ante excess saving in emerging markets and its implications for global real interest rates, see Bernanke (2005) and Bernanke et al (2011).

contrary, since governments never know when an extraordinary shock will hit, it is wise to aim at keeping debt at levels well below this threshold.

As with government debt, we have known for some time that when the private sector becomes highly indebted, the real economy can suffer.[47] But, what should we do about it? Current efforts focus on raising the cost of credit and making funding less readily available to would-be borrowers. Maybe we should go further, reducing both direct government subsidies and the preferential treatment debt receives. In the end, the only way out is to increase saving.

[47] See eg Tang and Upper (2010) for a study of debt deleveraging following systemic banking crises.

Appendix 1: Description and sources of data used in the paper

A. Non-financial sector debt

The time series constructed are generally taken from national balance sheet statistics (flow of funds) as available either from the OECD website or from national sources/databases (eg Federal Reserve Flow of Funds, Bank of Japan Flow of Funds). The target dataset is annual frequency beginning in 1980, for 18 OECD countries. The countries included in the sample are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.

The sectors covered are (i) households and non-profit institutions serving households (NPISHs) (S14 + S15); (ii) non-financial corporations (S11); and (iii) general government (S13), as defined in the System of National Accounts (SNA 2008) or its previous version (SNA 1993). For simplicity, debt is defined as the following (for all apart from the United States): gross liabilities for households and general government, and total liabilities less shares and other equities for non-financial corporations. For the United States, the item "credit market instruments" on the liabilities side is taken for each sector.

The debt series are mostly at market value and on a non-consolidated basis, so may differ from other sources. For many countries (all except Canada, Japan, Spain and the United States), the data under SNA 1993 are not available from 1980. Hence, these are extended/backdated[48] using data from old compilations. For example, for Italy and Sweden, old flow of funds data can be retrieved from their national websites. For France, Germany and the United Kingdom, old data are taken from old national sources.

For some countries, flow of funds data do not go back far enough, so we use other sources/proxy series. For non-financial corporations, an old OECD publication entitled "Non-financial enterprises financial statements" and bank credit data have been used to backdate the series.[49] For the household sector, bank credit/loans to households have been used. For general government, the IMF's historical public debt database (2010) has been used and the data gaps interpolated.[50, 51]

B. Other data used in the panel model

Gross national savings sourced from IMF, *World Economic Outlook*. Data on population, real GDP per capita and openness in current prices from Penn World Tables. Average number of years spent in school of population aged 15 and over taken from Barro and Lee (2000) (available only up to 2000 and every five years, interpolated by repeating the last available value). Data on consumer prices, overall dependency ratio and liquid liabilities as a share of GDP sourced from World Bank, *World Development Indicators*. Crisis dates taken from Carmen M Reinhart.[52]

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[48] Backdating is based on the first common period link method, where the level of the new series and growth rates of old series are reflected in the final time series. For Denmark and Norway, no backdates of household credit are available.

[49] Using bank credit may have limitations, as credit from capital markets is excluded.

[50] See Abbas et al (2010), http://www.imf.org/external/pubs/cat/longres.cfm?sk=24332.0. In general, the levels from the Flow of Funds total liabilities (which are the final series used) are higher than those from IMF public debt data, as there are more items included in the former. The data gaps/missing values are normally one to two years.

[51] Our debt database reflects data availability up to early 2011.

[52] http://terpconnect.umd.edu/~creinhar/Courses.html.

Appendix 2: Sectoral composition of non-financial debt

Table A2.1

Household debt

As a percentage of GDP

	Levels				Changes[2]		
	1980	1990	2000	2010[1]	1980–90	1990–2000	2000–10
United States	52	64	74	95	12	10	21
Japan	60	82	87	82	22	5	–5
Germany	59	61	73	64	2	13	–9
United Kingdom	37	73	75	106	36	2	31
France	27	46	47	69	18	2	22
Italy	6	21	30	53	15	9	23
Canada	56	63	67	94	7	4	27
Australia	42	46	74	113	5	27	39
Austria	41	41	47	57	0	6	10
Belgium	35	38	41	56	3	3	15
Denmark			95	152			57
Finland	29	48	35	67	19	–14	33
Greece	8	9	20	65	1	11	45
Netherlands	43	49	87	130	6	38	43
Norway			64	94			31
Portugal	15	23	75	106	7	52	31
Spain	24	41	54	91	17	13	37
Sweden	53	61	51	87	8	–10	36
Total of above							
Median	39	47	65	94	8	8	31
Weighted average[3]	46	60	69	90	14	9	18
Simple average	37	48	61	93	11	11	27
G7	43	59	65	87	16	6	16
Other advanced	32	39	58	97	7	14	34
Memo: Std deviation	*17*	*20*	*21*	*28*			

[1] Some figures refer to 2009. [2] In percentage points of GDP. [3] Based on 2005 GDP and PPP exchange rates.

Sources: OECD; national data, authors' estimates.

Table A2.2

Non-financial corporate debt

As a percentage of GDP

	Levels				Changes[2]		
	1980	1990	2000	2010[1]	1980–90	1990–2000	2000–10
United States	53	65	66	76	12	1	9
Japan	176	215	178	161	39	–37	–17
Germany	46	35	91	100	–11	56	9
United Kingdom	64	88	93	126	23	6	33
France	99	106	123	155	7	17	32
Italy	48	66	96	128	17	30	32
Canada	109	106	111	107	–4	5	–4
Australia	44	82	74	80	38	–8	6
Austria	86	78	82	99	–8	4	17
Belgium	73	86	136	185	12	51	49
Denmark	72	78	90	119	6	13	28
Finland	101	102	121	145	1	19	25
Greece	59	47	51	65	–12	3	15
Netherlands	98	119	140	121	21	21	–19
Norway	84	105	148	174	21	43	26
Portugal	93	50	114	153	–42	63	39
Spain	120	97	133	193	–23	36	60
Sweden	109	174	191	196	66	17	4
Total of above							
Median	85	87	112	126	9	17	21
Weighted average[3]	79	92	99	113	13	7	12
Simple average	85	94	113	128	9	19	19
G7	85	97	108	109	12	11	13
Other advanced	85	93	116	138	7	24	23
Memo: Std deviation	*33*	*44*	*37*	*44*			

[1] Some figures refer to 2009. [2] In percentage points of GDP. [3] Based on 2005 GDP and PPP exchange rates.

Sources: OECD; national data, authors' estimates.

Table A2.3

Government debt

As a percentage of GDP

	Levels				Changes[2]		
	1980	1990	2000	2010[1]	1980–90	1990–2000	2000–10
United States	46	71	58	97	25	–13	39
Japan	53	66	145	213	13	78	68
Germany	31	42	61	77	10	20	16
United Kingdom	58	42	54	89	–16	12	35
France	34	46	73	97	12	27	24
Italy	54	93	126	129	39	33	4
Canada	71	109	115	113	39	6	–3
Australia	43	46	37	41	3	–8	4
Austria	36	59	76	82	23	17	6
Belgium	61	140	121	115	79	–19	–6
Denmark	36	77	73	65	41	–5	–8
Finland	16	23	67	57	7	44	–9
Greece	26	83	124	132	57	42	7
Netherlands	65	97	67	76	33	–30	9
Norway	43	38	44	65	–6	6	21
Portugal	36	68	63	107	33	–6	45
Spain	27	49	71	72	21	22	1
Sweden	58	54	77	58	–4	24	–20
Total of above							
Median	43	63	72	97	22	15	7
Weighted average[3]	46	66	78	104	20	12	31
Simple average	44	67	81	93	23	14	13
G7	50	67	90	107	17	23	26
Other advanced	41	67	75	85	26	8	5
Memo: Std deviation	*15*	*29*	*31*	*29*			

[1] Some figures refer to 2009. [2] In percentage points of GDP. [3] Based on 2005 GDP and PPP exchange rates.

Sources: OECD; national data, authors' estimates.

Appendix 3: Detailed results for growth regressions

Table A3.1 **Growth regressions with debt and crisis variables**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**	**growth05**
National gross saving to GDP	0.0409	0.0550*	0.0430	0.0648**	0.0408	0.0689*	0.0635*	0.0437	0.0622*	0.0630*	0.0685*
	(0.026)	(0.030)	(0.027)	(0.030)	(0.025)	(0.035)	(0.030)	(0.027)	(0.032)	(0.031)	(0.033)
Change in population	–0.4482	–0.2540	–0.4183	–0.3689	–0.4531	–0.3593	–0.2684	–0.3907	–0.2883	–0.2687	–0.3658
	(0.362)	(0.349)	(0.385)	(0.342)	(0.371)	(0.344)	(0.362)	(0.401)	(0.349)	(0.362)	(0.346)
Schooling	0.0051***	0.0033	0.0054***	0.0034	0.0051***	0.0035*	0.0042*	0.0054***	0.0042*	0.0042**	0.0035*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Log of real per capita GDP	–0.1565***	–0.1635***	–0.1865***	–0.1568***	–0.1566***	–0.1591***	–0.1870***	–0.1872***	–0.1857***	–0.1868***	–0.1590***
	(0.015)	(0.018)	(0.014)	(0.015)	(0.014)	(0.017)	(0.015)	(0.015)	(0.015)	(0.016)	(0.017)
Trade openness	0.0311**	0.0326**	0.0341**	0.0305**	0.0311**	0.0306**	0.0312**	0.0343**	0.0308**	0.0312**	0.0304**
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)
Inflation rate	–0.0049	–0.0239	–0.0176	–0.0150	–0.0049	–0.0139	–0.0268	–0.0181	–0.0267	–0.0270	–0.0139
	(0.018)	(0.021)	(0.016)	(0.017)	(0.018)	(0.018)	(0.018)	(0.017)	(0.019)	(0.019)	(0.018)
Total dependency ratio	–0.1955***	–0.1814***	–0.2195***	–0.1972***	–0.1971***	–0.1925***	–0.2142***	–0.2117***	–0.2204***	–0.2145***	–0.1950***
	(0.044)	(0.045)	(0.041)	(0.045)	(0.045)	(0.043)	(0.041)	(0.040)	(0.042)	(0.039)	(0.043)
Liquid liabilities to GDP	0.9935	1.1207	1.2387***	1.0038	0.9995	0.9530	1.2702***	1.2166***	1.2968***	1.2753***	0.9643
	(0.693)	(0.662)	(0.387)	(0.683)	(0.647)	(0.783)	(0.368)	(0.373)	(0.445)	(0.432)	(0.724)
Banking crisis	–0.0134***	–0.0116***	–0.0135***	–0.0132***	–0.0135***	–0.0129***	–0.0136***	–0.0130***	–0.0141***	–0.0136***	–0.0131***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)
Total non-financial debt		–0.0078									
		(0.006)									
Government debt			–0.0167***				–0.0180**	–0.0174***	–0.0175***	–0.0180**	
			(0.005)				(0.006)	(0.006)	(0.006)	(0.006)	
Private debt				0.0016			–0.0023				
				(0.007)			(0.006)				
Corporate debt					0.0006			–0.0030		–0.0023	0.0008
					(0.007)			(0.006)		(0.007)	(0.008)
Household debt						0.0050			–0.0033	–0.0027	0.0047
						(0.014)			(0.012)	(0.012)	(0.013)
Constant	1.6429***	1.6854***	1.9714***	1.6102***	1.6441***	1.6717***	1.9243***	1.9781***	1.9136***	1.9225***	1.6709***
	(0.157)	(0.195)	(0.155)	(0.153)	(0.153)	(0.179)	(0.153)	(0.161)	(0.158)	(0.169)	(0.177)
Observations	383	354	383	354	383	354	354	383	354	354	354
R-squared	0.749	0.766	0.772	0.757	0.749	0.757	0.780	0.773	0.779	0.780	0.757

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table A3.2 **Growth regressions adding financial flow variables**

VARIABLES	(1) growth05	(2) growth05	(3) growth05	(4) growth05	(5) growth05	(6) growth05	(7) growth05	(8) growth05	(9) growth05	(10) growth05	(11) growth05
National gross saving to GDP	0.0240	0.0038	0.0193	0.0269	0.0241	0.0301	0.0071	0.0186	0.0098	0.0083	0.0298
	(0.020)	(0.021)	(0.016)	(0.025)	(0.020)	(0.027)	(0.018)	(0.017)	(0.021)	(0.020)	(0.028)
Change in population	–0.8203*	–0.5437	–0.6365*	–0.8679*	–0.8600*	–0.8272*	–0.5065	–0.5574	–0.6071	–0.5045	–0.8615*
	(0.444)	(0.490)	(0.363)	(0.464)	(0.456)	(0.458)	(0.406)	(0.392)	(0.370)	(0.409)	(0.470)
Schooling	0.0021	0.0021	0.0033	0.0022	0.0021	0.0023	0.0032	0.0035	0.0031	0.0032	0.0023
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Log of real per capita GDP	–0.1644***	–0.1746***	–0.2026***	–0.1670***	–0.1650***	–0.1691***	–0.2046***	–0.2049***	–0.2014***	–0.2053***	–0.1688***
	(0.015)	(0.019)	(0.014)	(0.014)	(0.014)	(0.018)	(0.015)	(0.016)	(0.015)	(0.019)	(0.017)
Trade openness	0.0184	0.0149	0.0118	0.0181	0.0185	0.0178	0.0103	0.0111	0.0112	0.0103	0.0179
	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.014)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)
Inflation rate	0.0035	0.0019	0.0009	0.0049	0.0032	0.0067	0.0016	0.0012	0.0010	0.0021	0.0060
	(0.023)	(0.025)	(0.019)	(0.023)	(0.023)	(0.024)	(0.021)	(0.020)	(0.022)	(0.023)	(0.024)
Total dependency ratio	–0.1888***	–0.1849***	–0.2320***	–0.1965***	–0.1958***	–0.1890***	–0.2270***	–0.2244***	–0.2350***	–0.2263***	–0.1948***
	(0.047)	(0.046)	(0.042)	(0.047)	(0.046)	(0.047)	(0.042)	(0.039)	(0.041)	(0.038)	(0.045)
Liquid liabilities to GDP	1.1373*	1.2306**	1.3937***	1.1389*	1.1720*	1.0664	1.4142***	1.3595***	1.4461***	1.4002***	1.1031
	(0.626)	(0.575)	(0.375)	(0.622)	(0.594)	(0.692)	(0.354)	(0.351)	(0.442)	(0.419)	(0.670)
Banking crisis	–0.0079***	–0.0059**	–0.0089***	–0.0086***	–0.0085***	–0.0079**	–0.0077***	–0.0081***	–0.0087***	–0.0076***	–0.0085**
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Five-year forward average of private borrowing to GDP	0.0437*	0.0259	0.0288*	0.0461*	0.0458*	0.0437*	0.0206	0.0242	0.0267	0.0204	0.0456*
	(0.023)	(0.027)	(0.016)	(0.025)	(0.024)	(0.024)	(0.020)	(0.019)	(0.017)	(0.021)	(0.025)
Five-year forward average of government borrowing to GDP	–0.0567	–0.0950***	–0.0939***	–0.0546	–0.0537	–0.0588	–0.1138***	–0.1019***	–0.1018***	–0.1140***	–0.0555
	(0.034)	(0.031)	(0.028)	(0.040)	(0.034)	(0.040)	(0.034)	(0.031)	(0.032)	(0.035)	(0.042)
Total non-financial debt		–0.0103*									
		(0.005)									
Government debt			–0.0208***				–0.0240***	–0.0226***	–0.0218***	–0.0240***	
			(0.004)				(0.006)	(0.005)	(0.004)	(0.005)	
Private debt				0.0030			–0.0051				
				(0.006)			(0.005)				
Corporate debt					0.0027			–0.0043		–0.0054	0.0023
					(0.007)			(0.006)		(0.006)	(0.007)
Household debt						0.0065			–0.0047	–0.0041	0.0057
						(0.011)			(0.010)	(0.010)	(0.011)
Constant	1.7571***	1.8342***	2.1818***	1.7318***	1.7630***	1.7976***	2.1482***	2.2080***	2.1131***	2.1538***	1.7958***
	(0.170)	(0.208)	(0.154)	(0.154)	(0.157)	(0.198)	(0.169)	(0.183)	(0.165)	(0.203)	(0.193)
Observations	362	354	362	354	362	354	354	362	354	354	354
R-squared	0.798	0.803	0.825	0.793	0.799	0.793	0.823	0.827	0.821	0.823	0.793

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table A3.3 **Growth regressions without crisis variable**

VARIABLES	(1) growth05	(2) growth05	(3) growth05	(4) growth05	(5) growth05	(6) growth05	(7) growth05	(8) growth05	(9) growth05	(10) growth05	(11) growth05
National gross saving to GDP	0.0395	0.0431	0.0414	0.0479	0.0414	0.0562	0.0462	0.0446	0.0502	0.0558	0.0611*
	(0.026)	(0.033)	(0.029)	(0.029)	(0.026)	(0.035)	(0.033)	(0.030)	(0.035)	(0.037)	(0.035)
Change in population	–0.2109	–0.0966	–0.1800	–0.1896	–0.1650	–0.2296	–0.0905	–0.1094	–0.1654	–0.0897	–0.1854
	(0.306)	(0.303)	(0.281)	(0.321)	(0.296)	(0.330)	(0.298)	(0.283)	(0.306)	(0.301)	(0.324)
Schooling	0.0051**	0.0019	0.0054***	0.0015	0.0051**	0.0017	0.0022	0.0054***	0.0021	0.0025	0.0020
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log of real per capita GDP	–0.1621***	–0.1729***	–0.1916***	–0.1567***	–0.1601***	–0.1634***	–0.1851***	–0.1936***	–0.1844***	–0.1898***	–0.1641***
	(0.017)	(0.020)	(0.020)	(0.019)	(0.019)	(0.021)	(0.021)	(0.019)	(0.022)	(0.022)	(0.022)
Trade openness	0.0407**	0.0452**	0.0437***	0.0445**	0.0401**	0.0444**	0.0455**	0.0433**	0.0456**	0.0451**	0.0439**
	(0.015)	(0.016)	(0.015)	(0.017)	(0.016)	(0.017)	(0.016)	(0.015)	(0.016)	(0.017)	(0.018)
Inflation rate	–0.0157	–0.0401	–0.0282	–0.0313	–0.0146	–0.0292	–0.0429	–0.0287	–0.0402	–0.0397	–0.0272
	(0.026)	(0.026)	(0.024)	(0.026)	(0.026)	(0.024)	(0.025)	(0.024)	(0.024)	(0.024)	(0.025)
Total dependency ratio	–0.1637***	–0.1533***	–0.1870***	–0.1521***	–0.1431**	–0.1658***	–0.1670***	–0.1614***	–0.1856***	–0.1624***	–0.1464***
	(0.054)	(0.051)	(0.052)	(0.049)	(0.056)	(0.049)	(0.049)	(0.052)	(0.049)	(0.048)	(0.049)
Liquid liabilities to GDP	0.3023	0.7008	0.5382	0.5013	0.2907	0.4208	0.7387	0.5598	0.6512	0.6486	0.3842
	(1.028)	(0.880)	(0.809)	(1.050)	(1.013)	(1.095)	(0.783)	(0.711)	(0.917)	(0.828)	(1.083)
Total non-financial debt		–0.0116**									
		(0.005)									
Government debt			–0.0164**				–0.0169**	–0.0191***	–0.0136*	–0.0165**	
			(0.007)				(0.007)	(0.006)	(0.008)	(0.007)	
Private debt				–0.0054			–0.0093**				
				(0.005)			(0.004)				
Corporate debt					–0.0082			–0.0117**		–0.0109*	–0.0078
					(0.006)			(0.005)		(0.005)	(0.006)
Household debt						0.0023			–0.0043	–0.0013	0.0055
						(0.014)			(0.014)	(0.014)	(0.014)
Constant	1.6835***	1.7789***	2.0059***	1.6251***	1.6615***	1.6877***	1.9234***	2.0268***	1.9139***	1.9616***	1.6876***
	(0.193)	(0.212)	(0.212)	(0.201)	(0.211)	(0.208)	(0.217)	(0.211)	(0.218)	(0.232)	(0.224)
Observations	383	354	383	354	383	354	354	383	354	354	354
R-squared	0.683	0.726	0.705	0.710	0.690	0.706	0.730	0.719	0.720	0.731	0.712

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

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