BANK FOR INTERNATIONAL SETTLEMENTS

A blind spot in today's macroeconomics?[1]

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We have got so used to it that we hardly notice it. It is the idea that, for all intents and purposes, when making sense of *first-order* macroeconomic outcomes we can treat the economy *as if* its output were a single good produced by a single firm. To be sure, economists have worked hard to accommodate variety in goods and services at various levels of aggregation. Moreover, just to mention two, the distinctions between tradeables and non-tradeables or, in some intellectual strands, between consumption and investment goods have a long and distinguished history. But much of the academic and policy debate among macroeconomists hardly goes beyond that, if at all.

The presumption that, as a first approximation, macroeconomics can treat the economy as if it produced a single good through a single firm has important implications. It implies that aggregate demand shortfalls, economic fluctuations and the longer-term evolution of productivity can be properly understood without reference to intersectoral and intrasectoral developments. That is, it implies that whether an economy produces more of one good rather than another or, indeed, whether one firm is more efficient than another in producing the same good are matters that can be safely ignored when examining macroeconomic outcomes. In other words, issues concerned with resource misallocations do not shed much light on the macroeconomy.

In my remarks today, I would like to suggest that the link between resource misallocations and macroeconomic outcomes may well be tighter than we think. Ignoring it points to a kind of blind spot in today's macroeconomics. It would thus be desirable to bridge the gap, investigate the nexus further and explore its policy implications. Today's conference is a welcome sign that the intellectual mood may be changing.

As an illustration, I will address this question from one specific angle: the role of finance in macroeconomics. As we now know, the Great Financial Crisis (GFC) has put paid to the notion that finance is simply a veil of no consequence for the macroeconomy – another firmly and widely held notion that has proved inadequate. I will first suggest, based on some recent empirical work, that the resource misallocations induced by large financial expansions and contractions (financial cycles) can cause material and long-lasting damage to productivity growth. I will then raise questions about the possible link between interest rates, resource misallocations and productivity. Here I will highlight the interaction between interest rates and the financial cycle and will also present some intriguing empirical regularities between the growing incidence of "zombie" firms in an economy and declining interest rates. I will finally draw some implications for further analysis and policy.

[1] I would like to thank Ryan Banerjee, Boris Hofmann, Enisse Kharroubi and Fabrizio Zampolli for their help in the preparation of these remarks and Stijn Claessens, Piti Disyatat, David Laidler, Robert McCauley, Hyun Song Shin and Kostas Tsatsaronis for their valuable comments.

I – The financial cycle-productivity nexus

The GFC has hammered home the message that financial cycles can cause huge economic damage.[2] As I like to stress, macroeconomics without the financial cycle is very much like Hamlet without the Prince (Borio (2014)). The self-reinforcing interaction between credit, risk-taking and asset prices, especially property prices, can lead to self-sustained expansions and contractions that, when sufficiently large, can produce deep recessions, shallow recoveries and persistently lower growth, leaving long-lasting scars on the economic tissue. This is so especially when banking crises occur.[3]

In seeking to explain these stylised facts, the profession has focused on the demand side and, moreover, has tended to treat the economy as if it produced a single good. In other words, it has focused on the Okun (or output) gap (Okun (1962)) as if its composition did not matter.[4] This is natural in some respects. What's more, there is no question that the financial cycle-induced collapse in expenditures is the main factor behind the damage we have seen.

But is this all? Might not resource misallocations also have played a role? Might they not have interacted closely with macroeconomic outcomes through their influence on both productive potential *and* their link with aggregate demand? This is indeed what we find in some recent work (Borio et al (2015)).

We proceed as follows. First, we decompose the evolution of labour productivity growth into a component that is common to all economic sectors and one that results from labour shifts across sectors – purely an identity.[5] We study labour shifts only because of data limitations: capital could be even more important, as sector-specific capital overhangs can have even longer-lasting effects. Think of overbuilding, for instance. Second, we explore how far each component is explained by measures of a credit boom, controlling for the influence of other factors. Finally, we examine how well the behaviour of the two productivity components *during credit booms* predicts the behaviour of productivity during subsequent recessions and their aftermath.[6] Here, too, we control for the influence of other factors and examine, in particular, how the evolution of productivity depends on whether a banking crisis occurs or not. We do all this in a sample of over 21 advanced economies over the period 1969–2013.

We come up with two key findings.

First, credit booms tend to undermine productivity growth as they occur. For a typical credit boom, a loss of just over a quarter of a percentage point per year is a kind of lower bound (Graph 1, left-hand column). The key mechanism is the credit boom's impact on labour shifts towards lower productivity growth sectors, notably a temporarily bloated construction sector. That is, there is an economically and

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[2] See, for instance, Drehmann et al (2012), Claessens et al (2011), Aikman et al (2015), Jordà et al (2013), Juselius and Drehmann (2015) and, using a different terminology, Reinhart and Rogoff (2009). For earlier studies of the financial cycle, see Borio et al (2001) or Borio and Lowe (2002) and for a recent survey of the literature, Claessens and Kose (2017). Drehmann et al (2012) also include references to previous work, as the notion of the financial cycle in fact predates that of the business cycle. This perspective contrasts starkly with that put forward by Lucas (2003).

[3] See the BCBS (2010) survey and, in particular, Cerra and Saxena (2008); for a more recent estimate, see Ball (2014). For more general evidence that bigger financial booms are associated with deeper recessions and longer recoveries after a financial bust, see Claessens et al (2011), Drehmann et al (2012) and Jordà et al (2013). For the costs of household credit booms, see in particular Mian et al (2015) and Drehmann et al (2017).

[4] This is not to deny the existence of models that consider explicitly one additional sector, such as housing. For instance, Iacoviello and Neri (2010) provide a model with housing and non-housing production where housing prices affect household borrowing capacity. More recently, Kaplan et al (2017), using a model which allows for house renting, show that the boom-bust cycle in house prices explains half the fluctuations in non-durable consumption in the United States.

[5] We borrow the decomposition from Olley and Pakes (1996), although they apply it across firms within a given sector.

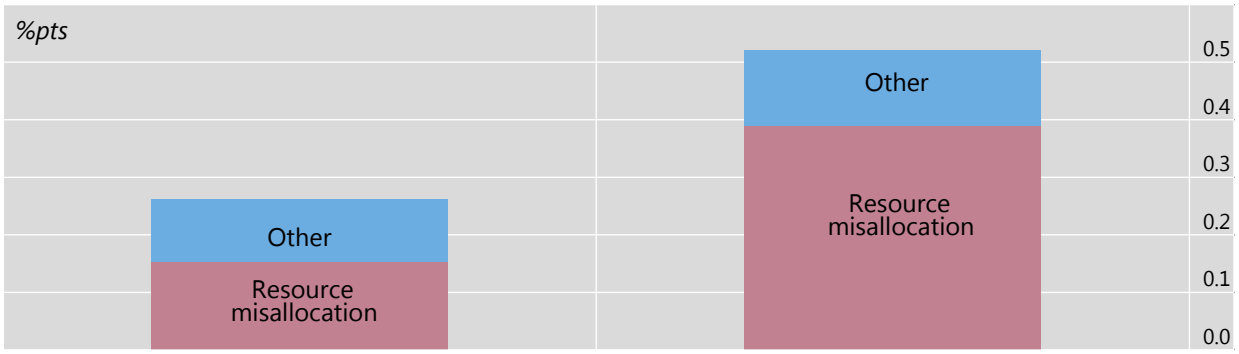
[6] This is a local-linear projection-type regression in the spirit of Jordà et al (2013).

statistically significant relationship between credit expansion and the allocation component of productivity growth (compare the left-hand panel with the right-hand panel of Graph 2). This mechanism accounts for slightly less than two thirds of the overall impact on productivity growth (Graph 1, left-hand column, blue portion). In other words, not only do credit booms undermine productivity growth, as already found by Cecchetti and Kharroubi (2015), but they do so mainly by inducing shifts of resources into lower productivity growth sectors.

Financial booms sap productivity by misallocating resources

Graph 1

Annual cost during a typical boom… … and over a five-year window post-crisis



Estimates calculated over the period 1969–2013 for 21 advanced economies. Resource misallocation = annual impact on productivity growth of labour shifts into less productive sectors during a five-year credit boom and over the period shown. Other = annual impact in the absence of reallocations during the boom.

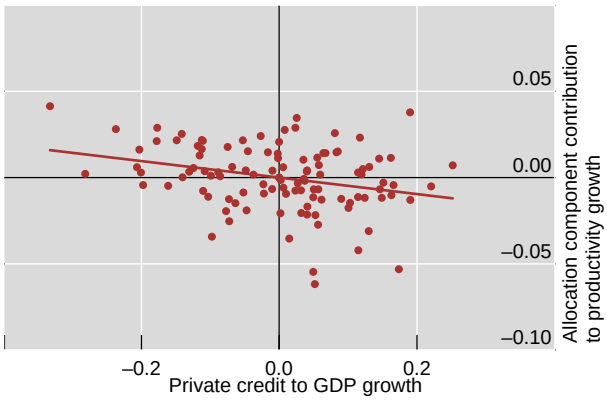
Source: Borio et al (2015).

Financial booms and productivity growth components

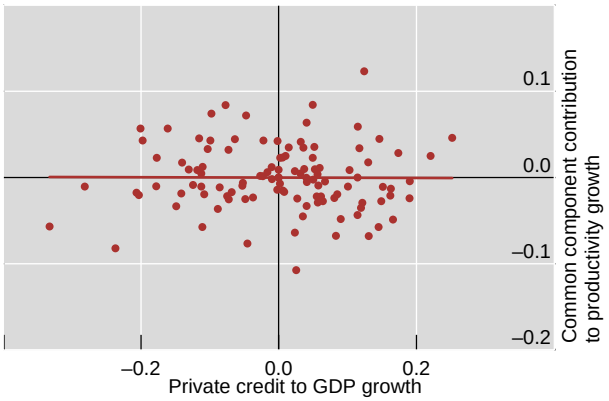
Computed over five-year windows and taken as deviations from country and period means

Graph 2

Credit booms and the allocation component



Credit booms and the common component



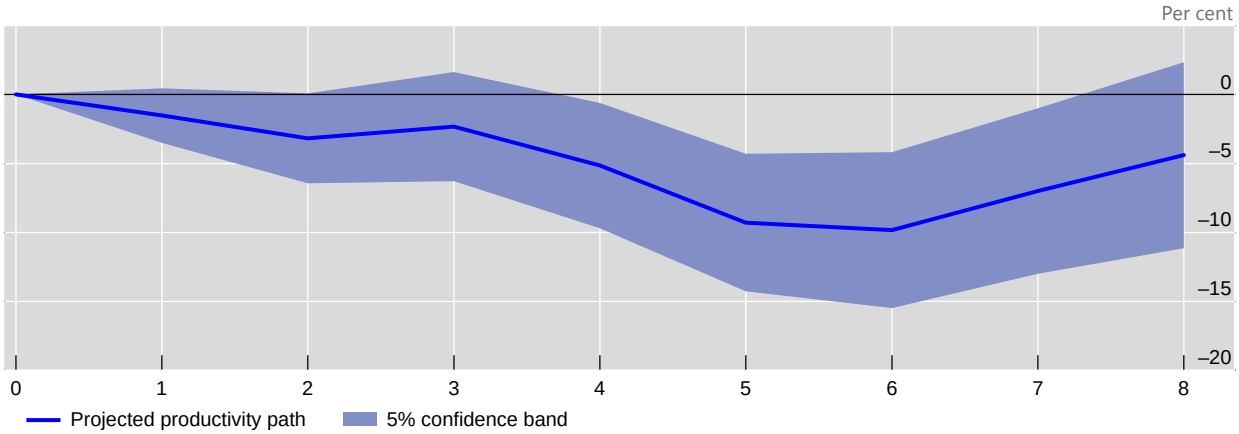
The panels plot the growth rate in private credit to GDP against the allocation and common components of labour productivity growth, respectively; both variables are taken as deviations from country and period means. The sample includes 21 economies and six periods of five years (1979–84; 1984–89; 1989–94; 1994–99; 1999–2004; 2004–09).

Source: Borio et al (2015).

Second, the subsequent impact of the labour reallocations *that occur during a financial boom* is much larger if a banking crisis follows. The average loss per year in the five years after a crisis is more than

twice that during the boom, around half a percentage point per year (Graph 1, right-hand column). Indeed, as shown in the simulation presented in Graph 3, the impact of productivity growth in that case is very long-lasting. The reallocations cast a long shadow.

Productivity stagnates after a financial crisis due to previous labour misallocations Graph 3



This simulation is based on local projection regressions of the percentage deviation of labour productivity from the recession year. The independent variables include the allocation and the common components of productivity growth over the three-year period prior to the start of the recession. The blue line shows the projection of labour productivity conditional on the occurrence of a financial crisis and a positive allocation component contribution of 0.85 percentage points over three years prior to the recession (first quarter of the distribution of the allocation component contribution). The blue area around the blue line represents the 5% confidence interval around the projected productivity path.

Source: Borio et al (2015).

The overall effects can be sizeable. Taking, say, a (synthetic) five-year credit boom and five post-crisis years together, the cumulative shortfall in productivity growth would amount to some 6 percentage points. Put differently, for the period 2008–13, we are talking about a loss of some 0.6 percentage points per year for the advanced economies that saw booms and crises. This is roughly equal to their actual average productivity growth during the same window. Now, the point is not to take these magnitudes at face value, but to note that these factors are material and should receive much more attention.

How could one explain the much larger impact of the misallocation of resources during the boom when a banking crisis follows? More research is needed, but a reasonable conjecture is that sectors that have expanded too much during the boom have to contract at some later stage – this is what allows us to talk about "misallocations" in the first place as opposed to mere reallocations. In this vein, the larger costs in the wake of a banking crisis may reflect, at least in part, how overindebtedness and a broken banking system hinder the required adjustment. For instance, if households are underwater, with mortgage debt exceeding the value of their house, they will find it harder to relocate to take advantage of job opportunities.[7] More to the point, banks with impaired balance sheets and high non-performing loans have strong incentives not to recognise losses and to misallocate credit: they will tend to keep the spigots open for weaker borrowers ("evergreening") while curtailing or increasing the cost of credit to healthier ones, which can afford to pay. Evidence confirms this.[8]

The analysis also enriches our understanding of how the productive capacity of the economy can be persistently weakened. Keeping with the presumption that the economy can be treated as if it produced

[7] See, for instance, Demyanyk et al (2017) for the United States and Henley (1998) for the United Kingdom.

[8] See, for instance, Caballero et al (2008), for Japan, Acharya et al (2016) for the European experience, Albertazzi and Marchetti (2010) and Schivardi et al (2017) for that of Italy.

a single good, macroeconomists have long recognised that persistent shortfalls in aggregate demand can sap supply: the unemployed lose their skills and a lack of investment undermines future productive potential, not least by slowing down the adoption of new technologies (Hall (2014), Reifschneider et al (2015), Anzoategui et al (2016)). But the structure of production matters too. The sectors that over-expand then need to contract towards a more sustainable size, in the process complicating the economy's adjustment to expansions and contractions in aggregate demand. Here the core of the problem is not the generalised shortfall of demand but the misallocation of resources across sectors; in fact, the abundance of aggregate demand during the boom is what helps promote the misallocation in the first place. This also means that the cure has to address the misallocation itself. This form of "hysteresis" or history-dependence definitely requires further study.

And what is true across sectors may also apply within sectors. There is indeed a growing body of work exploring this dimension, some of which is on display at this conference (eg Linarello et al (2017)).

From an analytical perspective, working at firm, rather than sector, level has advantages. Number of observations aside, a key one is that it is easier to control for "demand" factors: all firms in the same sector can more plausibly be assumed to face a similar demand for their output. This makes it easier to identify "misallocations"[9] and to tell them apart from differences that reflect the exposure to different demand (eg Gopinath et al (2017)). For example, lower-productivity sectors may expand simply because, as the economy grows richer, the demand for their output rises faster than that for other sectors, rather than because of a long-lasting imbalance. But this should not discourage the researcher from studying sectoral misallocations. From a macroeconomic perspective, they may be even more important.

II – The interest rate-productivity nexus

So much for the link between the financial cycle, resource misallocations and productivity. Might there not be also a link between interest rates, in particular *persistently* low interest rates, and productivity?

The standard argument is that such a link may well exist, but with causality running from productivity growth to real (inflation-adjusted) interest rates. This takes root in the notion that, over long enough periods, the real economy evolves independently of monetary policy – in jargon, "money neutrality". In that case, one can also presume that market interest rates converge to an equilibrium real interest rate (or natural rate) that depends exclusively on non-monetary factors (eg Bernanke (2005), Summers (2014), Bean et al (2015)). Under some auxiliary assumptions, productivity growth would be one such factor.

I have argued in detail elsewhere why this view may be overly simplistic and may play down too much the role of monetary factors (Borio (2017a)). Granted, it is a priori reasonable to expect that productivity growth would influence real interest rates. But the empirical evidence indicates that, *in general*, the link between real interest rates and productivity has been rather tenuous historically (Hamilton et al (2015), Lunsford and West (2017), Borio et al (2017)). And this evidence does not preclude the possibility that, under some conditions, the link may be present over horizons relevant for policy and that both real *and* nominal interest rates may matter too.

[9] The misallocations so identified may be of a different kind to the intersectoral ones mentioned above, which have an inherent intertemporal character (temporary demand-driven overexpansion of that at some point needs to be reversed).

One way a link may exist, but with *causality running from interest rates to productivity*, is through the interaction between interest rates and the financial cycle. Here, the policy response is critical. Consider in turn the expansion and contraction phases of the cycle.

During the expansion phase, low interest rates, especially if persistent, are likely to increase the cycle's amplitude and length. After all, one way in which monetary policy operates is precisely by boosting credit, asset prices and risk-taking. Indeed, there is plenty of evidence to this effect.[10] Moreover, the impact of low interest rates is unlikely to be uniform across the economy. Sectors naturally differ in their interest rate sensitivity. And so do firms within a given sector, depending on their need for external funds and ability to tap markets. For instance, the firms' age, size and collateral availability matter. To the extent that low interest rates boost financial booms and induce resource shifts into sectors such as construction or finance, they will also influence the evolution of productivity, especially if a banking crisis follows. Since financial cycles can be quite long – up to 16 to 20 years – and their impact on productivity growth quite persistent, thinking of changes in interest rates (monetary policy) as "neutral" is not helpful *over relevant policy horizons*.[11]

During the financial contraction, persistently low interest rates can contribute to this outcome (Borio (2014)). To be absolutely clear: low rates following a financial bust are welcome and necessary to stabilise the economy and prevent a downward spiral between the financial system and output. This is what the *crisis management phase* is all about. The question concerns the possible collateral damage of *persistently* and unusually low rates thereafter, when the priority is to repair balance sheets in the *crisis resolution phase*. Granted, low rates lighten borrowers' heavy debt burden, especially when that debt is at variable rates or can be refinanced at no cost. But they may also slow down the necessary balance sheet repair.

There are at least a couple of reasons for this. Persistently low rates may interact with bank weakness to delay the resolution of underlying balance sheet problems. It is easier to carry bad loans when their opportunity cost is lower. And it is more difficult to discriminate across borrowers when interest rates are very low, delaying their balance sheet repair. Ultimately, unprofitable firms could survive for longer, crowding out resources for the rest ("zombie lending").

While these mechanisms are quite plausible, specific empirical evidence is rather scant. As noted, most of the evidence relates to bank weakness as such rather than to the impact of persistently low interest rates per se. Clearly, distinguishing the two is not easy, as they would tend to coexist. There is also evidence that large-scale asset purchases have compressed credit risk premia (Gilchrist and Zakrajsek (2013), Rogers et al (2014), Altavilla et al (2015)) and, especially when buying the corporate assets themselves, helped reduce risk differentiation (ECB (2017a, b)).[12] But the impact of this effect on resource allocation has not been quantified. More analysis would be welcome.

Could there be a more *general* relationship between the level of interest rates and the incidence of unprofitable firms that survive? My colleagues Ryan Banerjee and Boris Hofmann have begun to examine this possibility (Banerjee and Hofmann (2018)). They take as a starting point the definition of "zombie firms" that the OECD has employed in its excellent research in this area – firms that are at least 10 years old and whose profits (EBIT) are insufficient to cover interest payments (eg Adalet McGowan et

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[10] For evidence on the impact of monetary policy on credit and asset prices, see eg Calza et al (2013), Bauer and Granziera (2017), Juselius et al (2017) and Hofmann and Peersman (2017a,b). For a description of the risk-taking channel and evidence, see eg Borio and Zhu (2012), Adrian and Shin (2010), Jimenez et al (2014), Dell'Ariccia et al (2017) and Cecchetti et al (2017).

[11] See also Borio et al (2017) for a more general empirical analysis finding evidence against money neutrality in this sense.

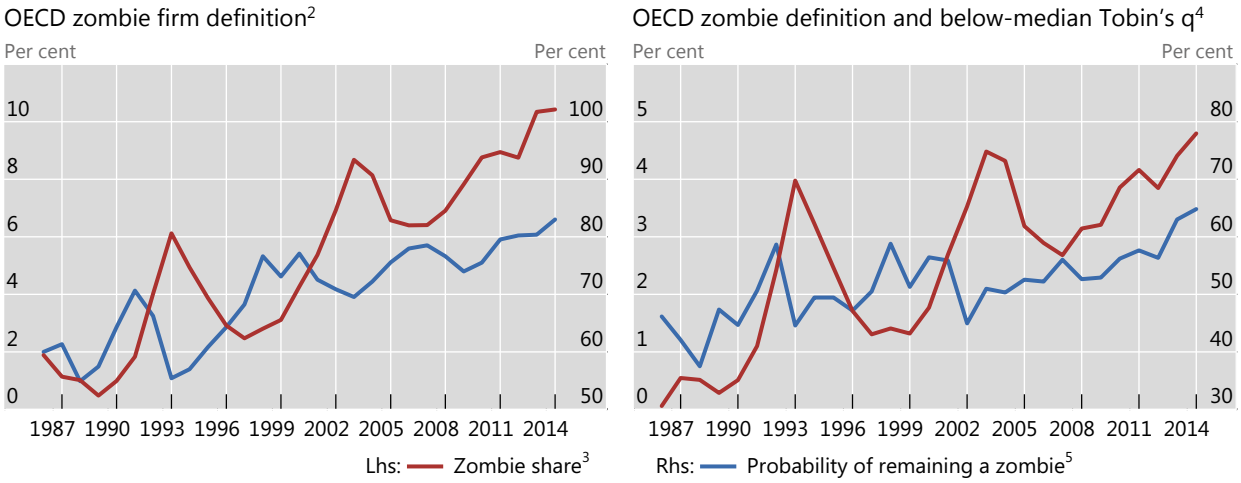
[12] An example of this lower credit risk differentiation is that firms have found it cheaper to issue in euros and then swap into dollars than to issue in dollars directly, in the process putting pressure on the cross-currency basis; see Borio et al (2016).

al (2017)). Then they further refine the definition by restricting zombie firms to be those with comparatively low expected future growth potential, ie those that also have below-median Tobin's q within a sector in a given year.[13] The more restrictive definition is intended to exclude the Teslas of this world – loss-making firms with strong future growth potential. They then examine a sample of nearly 32,000 publicly quoted firms from 14 OECD countries going as far back as 1980.[14]

The first point to note is that zombies have been on the rise and survive – if I can use that term – for longer. Cyclical variations aside, the mean share of publicly quoted zombie firms across these economies has steadily trended up, from close to zero to above 10% under the OECD definition (Graph 4, left-hand panel), and up to 5% under the more restrictive one (right-hand panel). Furthermore, zombies remain in that state for longer (both panels). For instance, based on the narrower definition, in 1987 the probability of a zombie firm remaining a zombie in the following year was approximately 40%; by 2016 it had risen to 65%. That probability is even higher based on the OECD definition.

Zombie firms on the rise and surviving for longer[1]

Graph 4



[1] Sample includes listed non-financial firms in Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the United States. [2] Zombie firm defined as a firm whose EBIT is below interest payments and is over 10 years old. [3] Ratio of the number of zombie firms to all listed firms. [4] Zombie firm defined as a firm whose EBIT is below interest payments, is over 10 years old and has below-median Tobin's q in its two-digit SIC sector in a given year. [5] Probability of a firm remaining a zombie in the following year, conditional on it being a zombie in the current year.

Source: Banerjee and Hofmann (2018).

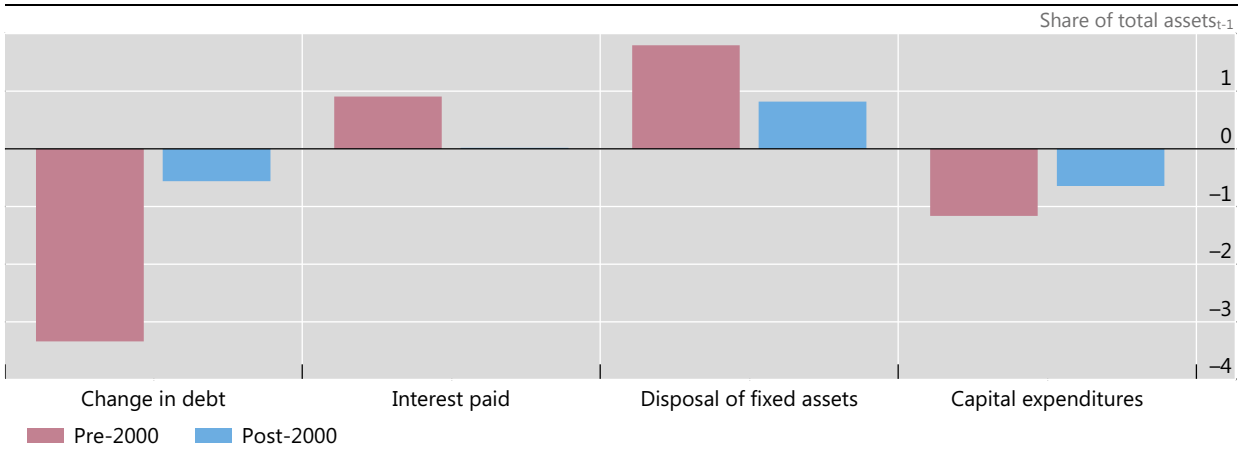
How are zombies today able to survive for longer than they did in the 1980s and 1990s? The answer at this stage can only be very preliminary. But one possibility is that, since the early 2000s, they seem to face less pressure to reduce debt. Regression estimates suggest that pre-2000 zombies cut debt at a rate of over 3% of total assets per year relative to non-zombie firms; but post-2000, the two groups are practically indistinguishable (Graph 5). At the same time, interest payments on their debt declined even

[13] This refinement of the zombie firm definition also produces stronger zombie congestion effects, whereby a greater share of zombies in a sector reduces investment and employment of non-zombie firms.

[14] Focusing on publicly quoted firms has two main advantages. First, the longer time span of data on these firms allows analysis over several business cycles. Second, it is possible to take into account the perceived future growth potential as reflected in equity prices. However, a significant drawback is that publicly quoted firms are only a limited subset of the universe of firms in an economy.

in relative terms (same graph). And this occurred even as zombies' coverage ratio also worsened over time (not shown).

Zombies' behaviour relative to non-zombies: over time, less pressure to cut debt[1] Graph 5



[1] Estimates of β_1 and β_2 from the regression $y_{i,t} = \beta_1 D(zombie_{pre-2000}) + \beta_2 D(zombie_{post-2000}) + \gamma Controls_{i,t} + \alpha_{sector,t} + \delta_{country,t} + \varepsilon_{i,t}$ where $D(zombie_t)$ is a dummy variable indicating whether firm i is classified as a zombie in period t. Control variables: ratio of fixed assets to total assets, industry cash flow volatility, market-to-book value, logarithm of total assets in 2010 US dollars, ratio of capital expenditures to total assets, ratio of R&D to sales, dummy variable indicating whether the firm pays a dividend. $\alpha_{sector,t}$, $\delta_{country,t}$.are sector-year and country-year dummy variables, respectively.

Source: Banerjee and Hofmann (2018).

The counterpart to this ability to avoid reducing debt, is that zombie firms have been locking in more resources, hindering the reallocation process. Relative to their more profitable peers, they have slowed down asset disposals and refrained from cutting capital expenditure (Graph 5).

But why should they have been better able to bear debt? What's intriguing and striking is the close relationship between the incidence of zombies and the decline in nominal interest rates (Graph 6, left-hand panel; the axis for interest rates is inverted). The relationship is remarkably tight.[15] This is true even if one excludes cyclical variations, in which, say, lower rates may reflect weak aggregate conditions. Moreover, the relationship does not derive so much from *temporarily* unprofitable firms. The length of time firms remain unprofitable increases as interest rates decline (right-hand panel).

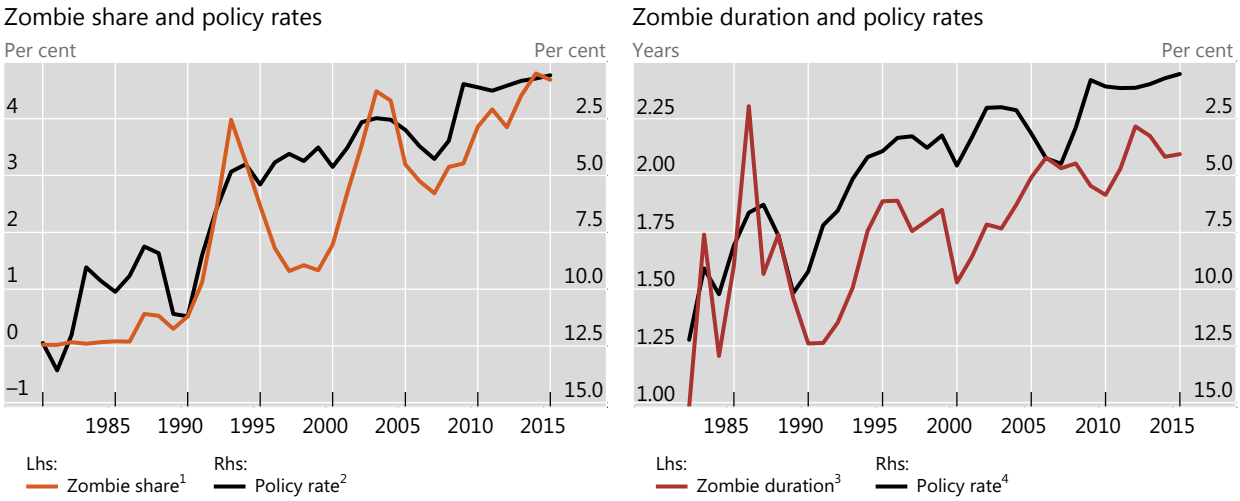
Now, the relationship could be purely coincidental. Possible factors, unrelated to interest rates as such, might help explain the observed relationship. One other possibility is reverse causality: weaker profitability, as productivity and economic activity decline in the aggregate, would tend to induce central banks to ease policy and reduce interest rates. This no doubt helps explain the cyclical variations, but is less compelling as an explanation of the trend and the ratcheting up. Still, the relationship may also point to a deeper link between interest rates and zombie firms. As argued above, under some conditions low rates may generate long-lasting damage to productivity, including by amplifying the financial cycle, thereby contributing to the emergence of zombie firms. In turn, persistently low rates may also encourage lenders to be more forgiving, especially as they hunt for yield and/or find the opportunity cost of not pulling the plug lower, thereby allowing zombies to survive for longer.

At this stage, we simply do not know enough. But a better understanding of the link would have significant implications for our understanding of what factors can drive resource misallocations and for policy. The OECD, for instance, has highlighted the drag on aggregate productivity that zombies can

[15] This is the case regardless of which of the two definitions of zombie firms is used.

induce, both directly and indirectly (Adalet McGowan et al (2017)). What's more, regardless of the reasons, the higher incidence of zombie firms makes the economy more vulnerable to increases in interest rates to more normal levels – an aspect of what I have elsewhere described as a debt trap (eg Borio 2017b)). All this raises difficult policy issues, ranging from appropriate targeted measures to broader structural and macroeconomic policies. Non-trivial trade-offs exist, especially in the short run.[16] Undoubtedly, the stylised fact deserves further study.[17]

Zombies rise and survive for longer as nominal interest rates decline — Graph 6



[1] Mean of country zombie shares; narrower definition. [2] Mean of country (nominal) policy rates. [3] Mean of zombie firm duration in years; narrower definition. [4] Mean of (nominal) policy rates.

Source: Banerjee and Hofmann (2018).

Conclusion

Let me conclude by highlighting the key takeaways of my remarks for analytics and policy.

I believe we need to go beyond the stark distinction between resource allocation and aggregate macroeconomic outcomes often implicit in current analysis and debates – a kind of blind spot in today's macroeconomics. There is a lot to be learned from studying their interaction as opposed to stressing their independence. I have illustrated this with a focus on the long-neglected link between finance and

16 For instance, it is generally recognised that it is always necessary to assess the firms' underlying prospects and then to proceed in an orderly way, based on that information and taking into account macroeconomic conditions. There are also trade-offs between different types of insolvency arrangements and adjustment speeds. Temporary support can play a useful role as part of a broader systematic strategy. Moreover, there are important issues about how to facilitate the redeployment of the resources that are released and limit the associated costs. Clearly, the longer firms remain in zombie status, the higher the costs relative to the benefits. And the costs are larger if banks are weak and not properly restructured, by recognising losses and recapitalising. For a detailed discussion of policies, see Andrews et al (2017) and, for one of some of the trade-offs involved, Haldane (2017).

17 Another interesting issue concerns cross-border effects, which may work on both borrowers and lenders. For instance, a large presence of zombie firms in one economy may cause congestion externalities on firm investment and employment in other economies, through exports or the operation of subsidiaries of multinational companies. Similarly, multinational banks may help transmit spillovers. And low interest rates in one economy may ease funding conditions elsewhere through a variety of mechanisms.

macroeconomic fluctuations. The financial cycle can cause first-order and long-lasting damage to productivity growth through its impact on resource misallocations. And we need to understand much better also the possible link between interest rates and such misallocations.

Policy, too, needs to be much better aware of these interactions. Some lessons are well understood, if not always put into practice. For instance, one such example is the need to tackle balance sheet repair head-on following a banking crisis so as to lay the basis for a strong and sustainable recovery (eg Borio et al (2010), Bech et al (2014)). Such a strategy is also important to relieve pressure on monetary policy. Doing so, however, has proved quite difficult in some jurisdictions following the GFC (eg Enria (2012), Borio (2016)). Other aspects need to be better incorporated into policy considerations. The impact of persistently low rates is one of them. How well all of this is done may well hold one of the keys to the resolution of the current policy challenges.

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