

Zombie Companies, Low Investment and Low Interest Rates

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Key Points

- The number of zombies has risen this century and growth has slowed. Both have a common cause in the bonus culture but, unlike Japan after 1990, there is no direct causal link.
- Ultra-low interest rates have not slowed growth. While monetary policy is largely responsible for the surge in inflation and the current high risk of another financial crisis, higher interest rates, not offset by other measures to stimulate the economy, would have slowed rather than boosted growth.
- The popularity of these misconceptions arises from (i) otherwise fully justified concerns about monetary policy, (ii) misunderstanding the concept of creative destruction, and (iii) confusing companies with the businesses they own.
- Overleveraged companies are refinanced or liquidated; the distinction depends on the difference between their scrap and potential stock market value, the relevance of which is denied by the consensus economic model. Analysing the issue thus requires the use of other economic models.

Introduction

The upper floors of houses lining the streets of eighteenth-century Edinburgh jutted out above the lower ones so that comments across the street were frequent and not always friendly. Sydney Smith remarked of one such quarrel ‘They will never agree, they are arguing from different premises’. This article considers the debate that has arisen over zombies and whether low interest rates cause slow growth. To have rational debate on such issues and avoid data mining a consistent model must be used and, as with any economic discussion, the conclusions differ with the one used. Their validity can then be tested against

data evidence, which inevitably provides a test for the models as well as an answer to the specific question. Without the use of a consistent model the debate will be based on conflicting premises.

I compare the conclusions which follow from different models. I use the consensus model ('CM'), the stock market model ('SMM'), the model used by Joseph Schumpeter ('SchM') and 'Evergreening', which is the term I give to describe the model used to see whether an analysis of Japan after its 1990 financial crisis¹ could be applied to the USA and other developed economies.² I then test the results of these models against relevant data and show how this leads to my two key conclusions.

- (i) The rise in the importance of zombies in the USA this century did not cause any slowdown in US growth, which had other causes. But slow growth and the rise in the number of zombies had a common cause in the bonus culture, which followed the dramatic change in management remuneration in the 1990s.
- (ii) The assumptions of the CM are falsified by data. I conclude, as others have before, that the economy does not have a single equilibrium, but several and that the monetary policy based on the CM is incapable of maintaining a path of growth accompanied by low and stable levels of inflation and unemployment.

I set out in Appendix 1 a description of these models and explain the differences between them, and thus their conclusions. The differences between these models are fundamentally epistemological, i.e. 'appertaining to the theory of knowledge', and I attribute a part of the unwillingness of many economists to discuss the problems with the CM, which are well illustrated by the debate on zombies, to their unfamiliarity with this branch of philosophy.

The extent to which zombies have risen in importance depends on the definition used, and the period and country being considered. One source estimates the average rise across Organisation for Economic Co-operation and Development (OECD) countries in zombies' contribution to the total output ratio to have been from 3% in 2003 to 5% in 2013.³ In this article I accept the

¹ 'Zombie lending and depressed restructuring in Japan' by Ricardo J. Caballero, Takeo Hoshi and Anil K. Kashyap (2008) *American Economic Review* 98, 5.

² 'Evergreening' by Miguel Faria-e-Castro, Pascal Paul and Juan M. Sánchez (July 2022) Federal Reserve Bank of San Francisco Working Paper 2022-14.

³ 'The walking dead? Zombie firms and productivity performance in OECD countries' by Müge Adalet McGowan, Dan Andrews and Valentine Millot (2017) OECD working paper 1372.

common conclusion that the proportion of output attributable to zombies has risen over this period, and probably this century, in developed economies including the USA. It should be noted however that zombies are agreed to account for not more than 6% of output. A recent paper from the Federal Reserve remarks that ‘... there is scant empirical evidence on the pervasiveness of zombies in the United States’.⁴

Interest Rates and Business Survival

Zombies are usually defined as firms that have difficulty meeting payments on their debt out of current profits before tax. When payments due on interest or principal are not met default occurs and lenders can force the company to restructure or be liquidated. If lenders wish to limit their losses, they will choose restructuring over liquidation if the business, which may now be financed solely with equity, has an operating value greater than it would be if scrapped. If lenders wish to disguise or postpone the realisation of their losses, they may simply reduce or postpone interest payments and reduce the book valuation of the debt by less than the hit to their profits that would follow financial restructuring.

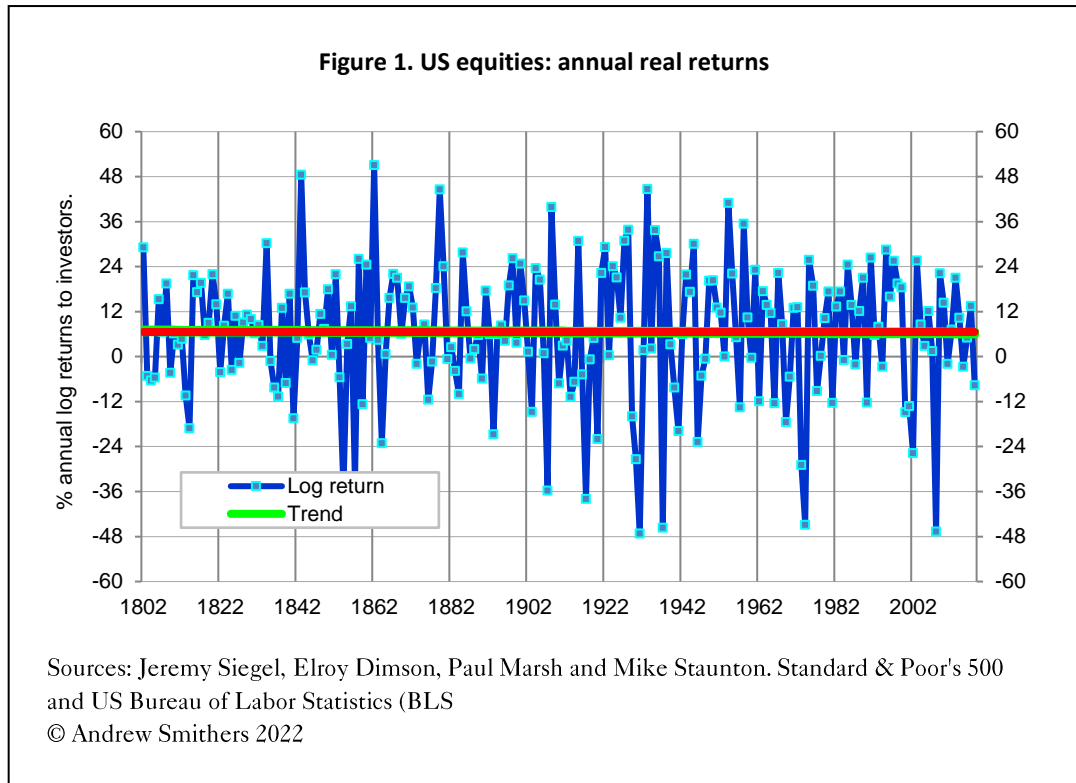
Businesses are viable so long as they are more valuable when operating than if liquidated. Using the SMM this criterion is clearly satisfied if a business’s value if quoted would be above its scrap value. It costs money to obtain a quotation, so the break-even level of value above which companies will not be scrapped is some premium above their probable value if quoted. The usual difference assumed between the value of listed and unlisted stocks is 25%.⁵ Allowing for this it will not pay lenders, according to the SMM, to liquidate rather than restructure, which will involve them in receiving equity in place of debt. The equity of the company they will then own plus any continuing debt will then be worth more than the proceeds of liquidation.

The ratio of quoted companies’ stock market value to their net worth is q , which is mean reverting and averages 1. On average over time therefore the average company is valued by the stock market at its net worth. If quoted

⁴ ‘Zombie lending to US firms’ (2022) by Giovanni Favara, Camelia Minoiu and Ander Perez-Orive, all of whom are ‘affiliated’ with the Federal Reserve Board.

⁵ This is for example the discount at which the Federal Reserve values unquoted compared with quoted companies in its Z1 Financial Statistics of the United States (lines 41 and 42).

companies are on average to be worth more than their scrap value, their flow of profits after tax must at least match the ‘hurdle rate’, which is the expected real return on equity required to justify new investment.⁶ We know from the stability of the long-term real return on equity that this hurdle rate is around 6½%, as illustrated in Figure 1.⁷



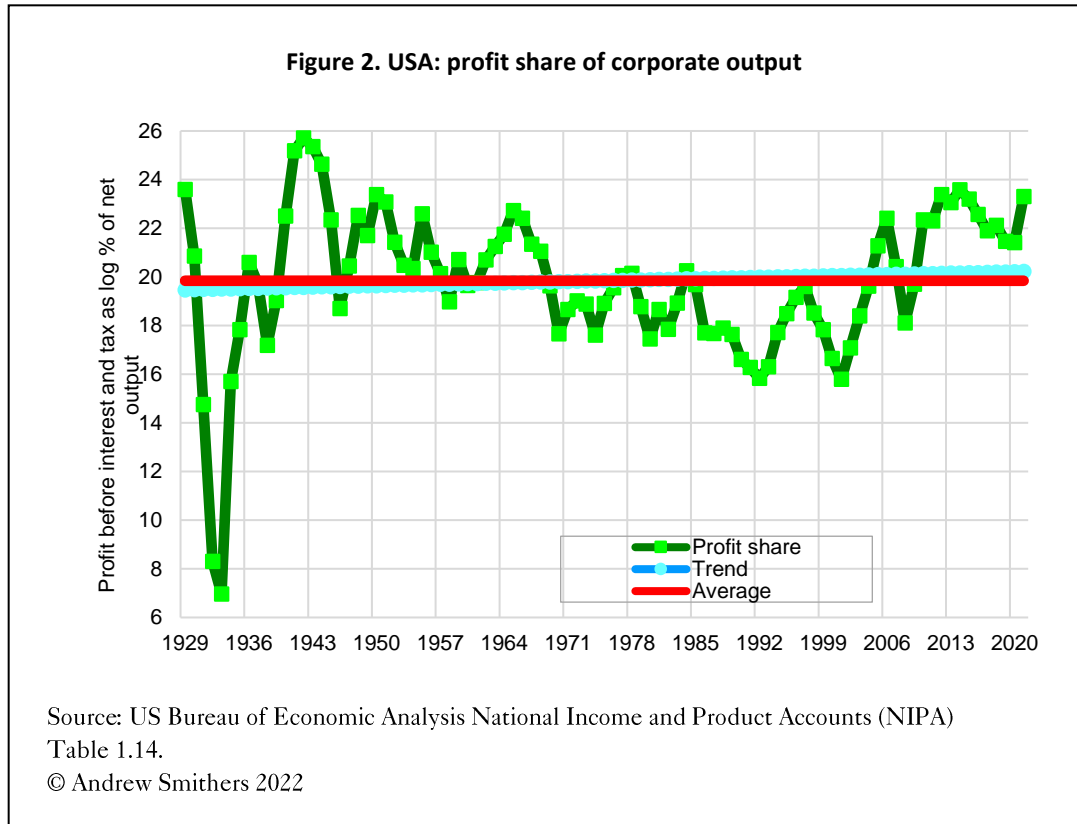
If the flow of profits at times of full employment is sufficient to give a return on an unleveraged business above 6½% of its scrap value it would be valued, if quoted on the stock market at average market levels, at more than its scrap value, which will be below its net worth and usually its book value.⁸

⁶ This definition is different from that used in ‘A general equilibrium approach to monetary theory’ by James Tobin (1969) *Journal of Money, Credit and Banking* 1, 1. Tobin’s Q is defined as the ratio between the financial markets’ value of equity plus debt/net worth plus debt. Both *q* and *Q* are mean reverting but, while the return on equity is stationary at c. 6½% in real terms, it is not on equity plus debt (the user cost of business capital) as this varies with the degree of leverage (the ratio of equity to debt), because the cost of debt differs from that of equity and is usually much lower.

⁷ The chart is a copy of Figure 22 from *The Economics of The Stock Market* by Andrew Smithers (2022) Oxford University Press. The mean reversion of the long-term real return on equity is shown by the near identity of the average real log return and its trend.

⁸ As with Figure 1, the probability that the profit share is mean reverting, in accord with the Cobb–Douglas production function, is indicated by the closeness of the trend to the average.

Profits fluctuate but, as Figure 2 illustrates, the profit share of output appears to be stable over time. Businesses will not usually be scrapped due to temporary declines in profits during recessions, but they will be if their returns are inadequate in times of full employment.



The distinction between the value as a going concern and in liquidation (scrap value) is well known and understood by accountants but, while it fits readily with the SMM, it has no place in the CM which assumes that managers, in the interests of shareholders, ignore the stock market value of their companies and in their decisions seek to maximise the present value of their companies' net worth ('profit maximisation'). Under the assumptions of the CM, the Modigliani–Miller theorem is valid so leverage adds no value to companies, as the cost of capital is unaffected by the level of debt. This does not, however,

apply to stock market values as research shows that increased leverage tends to push up share prices.⁹

The stock market uses price/earnings (PE) multiples as the basic tool for valuing companies, and companies which are underleveraged are at risk of being taken over, because the company will be worth more, valued at the same PE, if some of its equity is replaced by debt. As senior managements wish to keep their jobs, which they risk if their companies are taken over, companies are habitually leveraged. One of the many differences between the two models of the economy is that the SMM assumes that managers seek to maximise the stock market value of their companies and the CM assumes that their concern is with the present value of their companies' net worth.

The difference between going concern and scrap value involves the stock market as the arbiter. Companies remain in business if their saleable value when operating is greater than their value if liquidated and, even if not listed, their going concern value will depend on the value they would have if quoted. As the CM denies the relevance of stock market value in business decisions it cannot be used to assess the impact of interest rates on the viability of individual businesses. Since, moreover, the CM assumes that companies, presumably including banks, ignore stock market values when making decisions, it cannot be used to explain the difference between net worth and value in liquidation and therefore be useable in a debate on zombies.

In the stock market companies are more valuable if leveraged, but this exposes them to the risk of being unable to meet their interest payments if profits fall or, if they have short-term debt, interest rates rise. This rarely causes the business to be liquidated as the companies can usually be recapitalised. Typically creditors receive equity in exchange for debt, the book value of the assets is written down and, as depreciation applies to the new book value, the operating costs of the business decline. Equity returns rise if weak businesses unexpectedly flourish. This upside potential, the option value, is not available to creditors: to compensate for it the rate of interest charged must be higher than the equity return at scrap value. No option value attaches to the company's debt so businesses with low profitability are unable to raise debt.

⁹ 'The determination of financial structure: The incentive signalling approach' by Stephen Ross (1977) *Bell Journal of Economics* 8.

All businesses need equity, but none need debt. To be viable as a going concern their return on equity measured at scrap value, at least in prospect, must match the hurdle rate under conditions of full employment. Shareholders may choose not to liquidate companies having current returns on equity lower than this, either because the company qualifies as a start-up or because profits are depressed in a recession. The criterion which determines viability is, however, the expected return on equity once the business is established in conditions of full employment. This is the hurdle rate of around 6½% in the SMM and does not vary with changes in either short-term interest rates or long-dated bond yields.

At levels of low business profitability, the companies which own them will not be leveraged and will thus be indifferent to the current level of interest rates. Businesses are not therefore kept alive by low interest rates.

Postponed Loss Realisation

If banks seek to limit their losses, the rate of corporate liquidations will be unaffected by the level of interest rates. It is argued, however, that banks' behaviour can and has changed as some have increasingly sought to disguise rather than limit their losses. The motive for delaying restructuring is to reduce the hit to banks' published profits and balance sheets. If it occurs, it results in a rise in the number of zombies. The argument that this reduces growth depends on the following steps and the claim is applied both to this century and to the period from 2003 to 2013.¹⁰

(i) The productivity of zombies is below average

The data which support this are derived from the reports published by companies.¹¹ Labour productivity data are not normally published by companies and those used appear to be derived by a complicated process, the reliability of which I question, partly because of the data source it uses. I set out in Appendix 1 some comments on the intrinsic unreliability of corporate data. It is inherently

¹⁰ This is the period over which the firm productivity is measured in 'Measuring total factor productivity at the firm level using OECD-Orbis' by Peter N. Gal (2013) OECD Working paper 1049 and the period over which it is claimed that zombie investment has crowded out that of others in both Adalet McGowan, Andrews and Millot (2017) and Faria-e-Castro, Paul and Sánchez (2022).

¹¹ Gal (2013).

likely, however, that zombies will have poor labour and multifactor ('TFP or MFP') productivity. The assumption is thus likely to be correct. It should, however, be noted that national income data do not suffer from the same problems and, where appropriate, should be used in preference to those derived from company reports.

(ii) The low productivity of zombies applies to their output from new investment as well as that on their existing capital

This does not follow from (i). It does not seem to be measured and is probably not measurable. The productivity of new investment is greater than that of the existing capital stock and, while it is reasonable to assume that new investment by zombies is less efficient than that of other companies, it is unlikely to be less efficient than the existing capital stock. This is because the average life of fixed, productive capital stock is 16 years, so that much of the existing stock will use technology which is 20 years or more out of date. Additional investment by zombies, due to the provision of subsidised finance, is thus likely to enhance growth unless it reduces investment by strong companies to a matching extent, i.e. by 100%.

(iii) Zombies are provided with subsidised capital for new investment by the banks, who delay forcing their balance sheet reconstruction

I have been unable to find data supporting this but equally none that refute it.

(iv) This reduces the investment of more efficient companies by crowding out

(v) Crowding out can arise either through reducing the return on new investment or by raising the cost or availability of finance

The return on new investment depends on its efficiency (the incremental capital/output ratio) and the current level of profit margins. Investment by zombies cannot affect the capital/output ratio of others which depends on the available technology. Crowding out can therefore occur only if it lowers profit margins or inhibits strong companies from raising finance. As Figure 2 illustrates, profit margins have risen from their low in 2000 and, over the period 2003 to 2013, whatever the reason for weak investment it cannot have been due in the USA to weak profit margins.

Finance for US business did not become expensive or in any way restricted between 2003 and 2013, nor indeed at any time during this century. The cost of corporate capital fell over the period. Short-term interest rates, long-dated bond yields and equities have at times been volatile but short-term rates and long-dated bond yields fell over the period, in both nominal and real terms, and the rise in equity prices has reduced the cost of equity by raising the q ratio.¹²

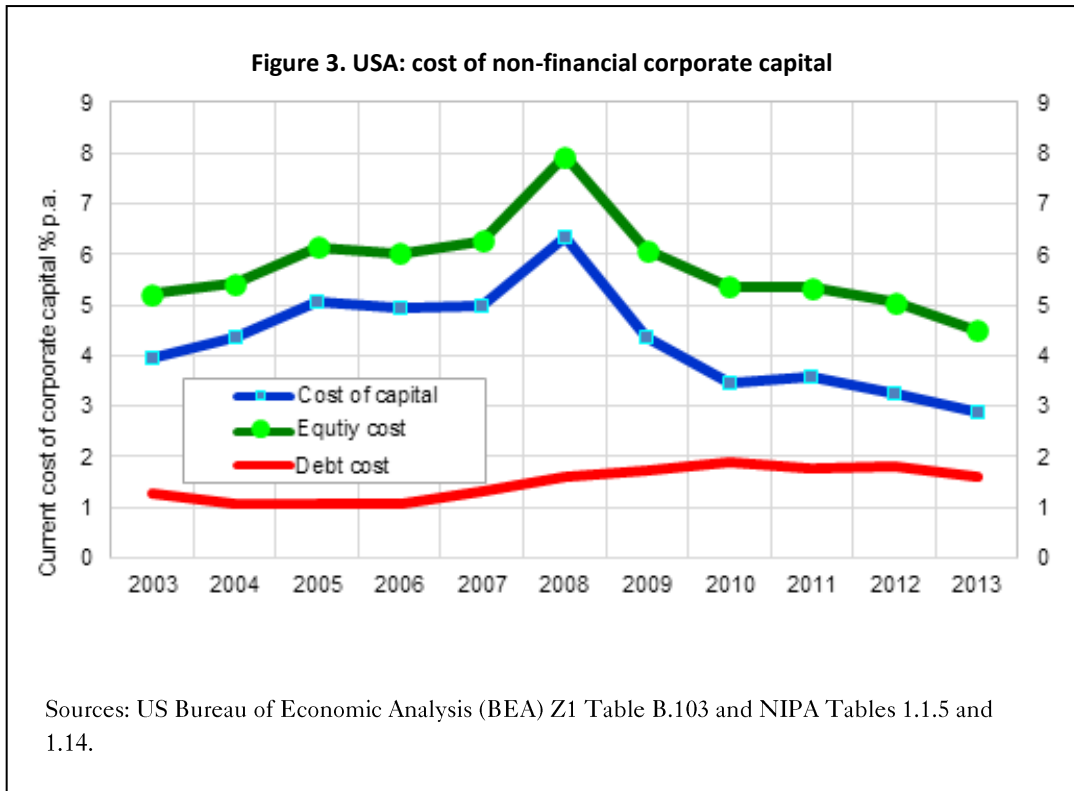


Figure 3 shows that the cost of corporate capital fell from 2003 to 2013. Despite the fall in short- and long-term interest rates, the cost of debt rose slightly due to the change in its composition as companies increased their ratio of long-dated bonds to short-term debt. The fall in long-dated bond yields encouraged a rise in leverage and as debt, whether long- or short-term, is much cheaper than equity, this led to the overall decline in the cost of capital.

¹² We know the cost of corporate capital from the data on financial market returns and data on leverage published by the Federal Reserve in the Z1 series. This is accepted by the SMM but is inconsistent with the CM, as explained in Appendix 1.

The rise in profit margins, the fall in interest rates and the cost of capital, combined with the absence of any restriction on its availability, means that if subsidised lending to zombies did occur it did not result in crowding out and to depressing investment by stronger companies.

The original idea that an increase in the importance of zombies could hinder output growth comes from an analysis of Japanese banking following the country's stock market collapse in 1990.¹³ It argues that bank balance sheets were seriously damaged by falls in land and share prices, but this was far from fully recognised by regulators. Had the level of bad loans been recognised, bank equity would have fallen below internationally agreed levels and the number of banks that would have collapsed would have been too great for the economy to withstand. The regulators therefore turned a blind eye to the level of bad loans and encouraged banks to support poor companies. With the constraint that existed on their balance sheets and thus the severe limit to their expansion, supporting zombies necessitated limiting the supply of bank finance to stronger companies. Bank lending was a major source of finance to companies and so the investment by strong companies was crowded out by lending to zombies.

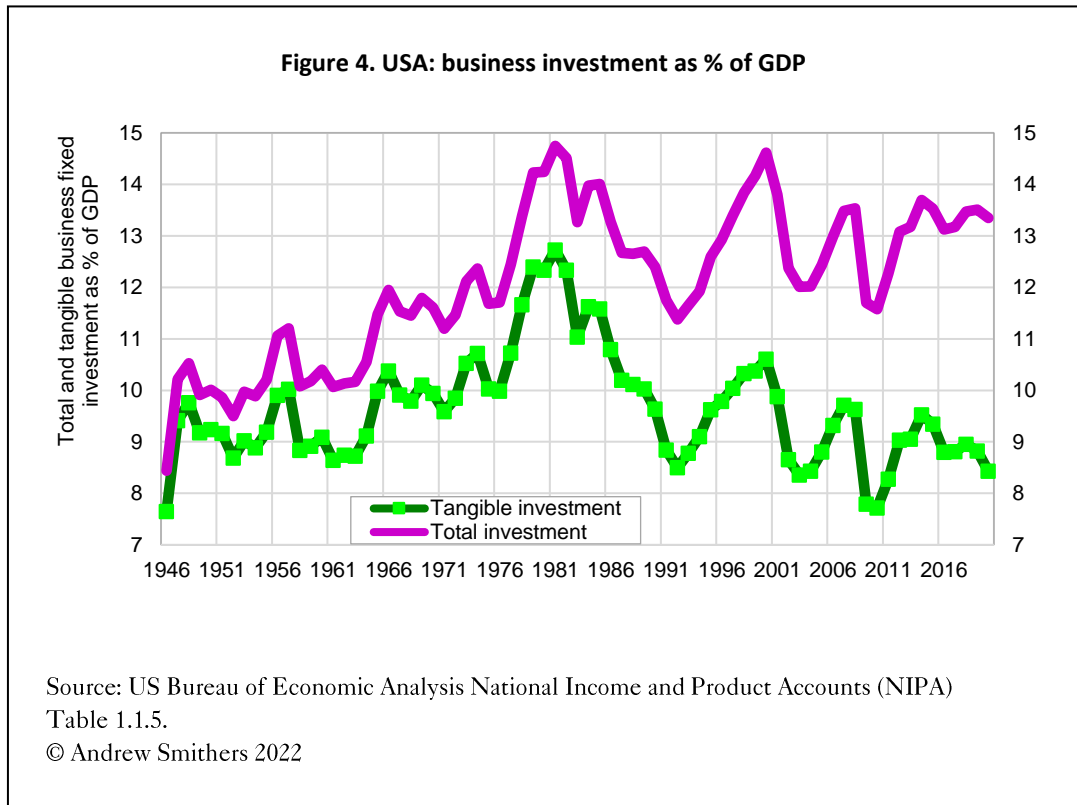
None of these conditions applies to the USA. While the evidence is against the claim that the rise in zombies has had any impact on US growth, it may well have depressed Japanese growth after the crash of 1990.

(vi) There is a causal relationship between the decline in business investment this century and the rise in the importance of zombies

This can be tested by seeing if there has been any relationship in the way the two have changed.

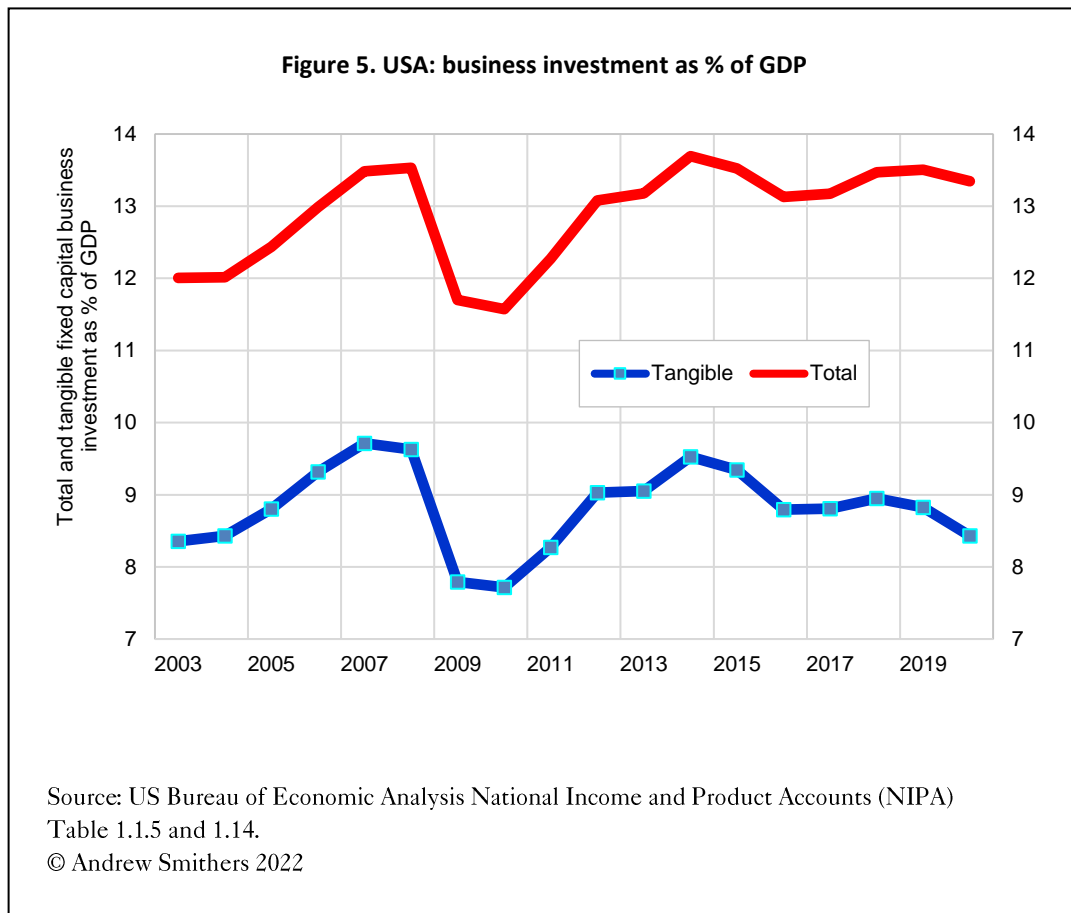
As Figure 4 illustrates, business investment has fallen as a percentage of GDP since 2000 and has fallen particularly for tangible investment. Output potential changes with the value of the fixed capital stock and, as depreciation for intangibles is many times more rapid than that for tangibles, growth depends mainly on the level of fixed tangible investment. The slowdown in growth this century is the inevitable result of the fall in tangible investment and appears to have been accompanied by a rise in the proportion of zombies. It is, however, unlikely that the rise of zombies has caused the fall in investment as the former

¹³ Caballero, Hoshi and Kashyap (2008).



is claimed to have risen from 2003 to 2013, while business investment both total and tangible rose as a percentage of GDP, as illustrated in Figure 5. While an increase in zombies has accompanied the fall in business investment since 2000, the rise in investment from 2003 to 2013 shows that the two have not been correlated and cannot therefore support claims of a causal relationship.

Possible causes for the decline in tangible investment after 2000 include (i) a slowdown in the rate of technological advance, of which there is no obvious sign, (ii) a rise in the cost of capital, which has fallen and (iii) weak demand, which has not occurred judging from low and falling levels of unemployment. The need for another explanation for the apparent low level of ‘the animal spirits of entrepreneurs’ is underlined by the marked change in relationship between the return on equity (‘RoE’) and the level of business investment over the following three years. From Q1 1972 to Q4 1999 the R^2 correlation between non-financial



companies’ tangible business investment three years later and their RoEs was 0.74, while from Q4 2000 to Q3 2017 it was 0.01.¹⁴

This sharp change followed the dramatic change in management remuneration in the 1990s and seems likely to have been a major cause for low tangible business investment and thus of slow growth. The weakness in investment after 2000 fits with the change in business incentives which occurred in the 1990s but not with the continuing rise in the importance of zombies, which is claimed to have occurred since 2003. Two different motives can be reasonably attributed to banks for their wish to delay the published costs of reorganising the balance sheets of debtors in default. In Japan this was the need to avoid banks having inadequate capital judged by internationally agreed yardsticks, with the

¹⁴ See Table 12 from *Productivity and the Bonus Culture* by Andrew Smithers (2019) Oxford University Press.

regulators giving tacit approval. In the USA a more likely motive is the wish of bank managers to secure large bonuses. As these are usually linked to profits, delaying a hit to profits will often increase managers' remuneration. While it is unlikely that the increase in zombies had any direct impact on investment and growth, it is very likely that both have a common cause in the dramatic change in incentives that occurred in the 1990s.¹⁵

Zombies and Liquidations

Among the different theories to support claims that the rise in zombies damaged growth one assumes that zombies' investment was subsidised and resulted in a crowding out of more efficient investment by stronger companies. As shown above, this is inconsistent with the data on profit margins and the cost and availability of capital. Another is set out in Faria-e-Castro, Paul and Sánchez (2022) (Evergreening) which assumes that more zombies mean fewer liquidations and that this will support short-term growth but slow it over a longer horizon. Referring to the probable change in banks' attitude to restructuring '... such lending behaviour may stabilize an economy in the short run, preventing bankruptcies and worker layoffs. After the crisis passes, however, it may contribute to less productive firms remaining in business, leading to the creation of "zombie firms", and depressing aggregate productivity and economic growth.'¹⁶ Absence of destruction is termed sclerosis and defined as '— the preservation of production units that would not be saved without the banks' subsidies'.

The view that postponement of restructuring reduces business liquidations is assumed rather than supported by data and the presumed relationship between growth and scrapping inverts that set out by Solow et al., in which scrapping rises with the growth in productivity.¹⁷ The Evergreening argument thus differs from the SchM assumption that recessions are necessary for growth by causing scrapping; it assumes that a lack of scrapping slows growth. Both differ from the CM and the SMM, in which there is also a causal relationship between growth and scrapping, but the CM and the SMM assume that faster

¹⁵ Smithers (2019).

¹⁶ Faria-e-Castro, Paul and Sánchez (2022).

¹⁷ 'Neoclassical growth with fixed factor proportions' by R.M. Solow, J. Tobin, C.C. Weizsacker and M. Yaari (1966) *The Review of Economic Studies* 33, 2.

growth leads to more scrapping, while Evergreening assumes that a reduction in scrapping will slow growth.

Both Evergreening and the SMM are agreed that managements have their own utility preferences and thus both differ from the CM, which assumes that their actions are determined by having the same interests and utility preferences as their shareholders, and that these lie in profit maximisation.

Liquidations are likely to have been low this century independent of any impact from debt waivers because real wages per employee have grown so slowly and profit margins have improved since 2000, when they hit a post-war low (Figure 2).¹⁸

Creative Destruction

It is likely that the source of this confusion over zombies and liquidation arises over the concept of ‘creative destruction’ set out by the Austrian economist Joseph Schumpeter.¹⁹ Compared with current growth theory, he placed the driving force for growth less on invention than on innovation, which is the commercial application of new technology rather than its discovery. I am very sympathetic to this which, in more modern terminology, involves the important distinction between ‘hard-baked clay’, which requires investment in tangible produced assets to be effective, and ‘putty-putty’, in which labour productivity improves without the need for physical investment.²⁰ While it is generally accepted that advances can arise from both processes, it is important to distinguish between them. As Martin Weale writes

Andrew Smithers rejects the conventional growth accounting framework as a means of determining the contribution of investment to economic growth on the grounds that the technology of the time is embedded in investment as it takes place. Thus technical progress and investment are intertwined in a way that growth accounting does not generally recognise. In this case very stringent assumptions are needed for the growth accounting framework to function—most notably that the labour/capital ratio has to be as flexible on old capital as it is before capital is installed. Such a ‘putty-putty’ proposition seems most unlikely to be true.²¹

¹⁸ This applies whether margins are measured for all companies, as in Figure 2, or solely for non-financials.

¹⁹ Notably in *Capitalism, Socialism and Democracy* (1942) New York: Harper & Brothers.

²⁰ ‘Substitution and fixed proportions in the theory of capital’ by Robert M. Solow (1962) *Review of Economic Studies* 29.

²¹ Martin Weale’s Foreword to Smithers (2019).

Schumpeter, however, not only used the term ‘creative destruction’ as a helpful description of how long-term growth depends on replacing obsolete plant with new, but also sought to use it to explain trade cycles. In the SchM, new investment is needed to escape stagnation under which companies are assumed to make no profits. In the absence of growth prices are assumed to equal both marginal and average costs, measured without any allowance for the cost of capital. They have therefore no funds to pay for investment unless they raise debt, which is assumed to be available only from banks. But the SchM’s basic assumption is contrary to the data on the profit share of output, which were not available in 1942. The data show that the share is stable and independent of the rate of growth of the economy.

Depreciation provides funds for investment and, with advances in technology, the equipment financed by depreciation will be more productive per unit of labour than the old equipment which is scrapped. The absence of any funds for new investment in the SchM assumes that in an economy with zero growth there is no depreciation, and the cost of capital is zero. Neither of these assumptions are compatible with the data. It seems generally agreed that there is no apparent connection between growth and either interest rates or the cost of capital. While depreciation moves with real wages,²² it would fall to zero if their growth were its only determinant, as set out in by Solow et al (1966). But it does not seem to fall to zero when there is no growth. According to the US Bureau of Economic Analysis (‘BEA’), ‘depreciation is defined as the decline in the value of the stock of assets due to wear and tear, obsolescence, accidental damage, and aging’.²³ It is important to distinguish between these sources. The capital stock falls in value as real wages rise because the output from existing plant with its embedded technology does not rise.

The capital stock falls in value through obsolescence as real wages rise and the value of output from plant with its embedded technology falls. Profits therefore fall and the value of capital declines. This cause of depreciation may be called obsolescence, but it does not occur simply through time passing, but only as real wages rise.²⁴ Properly maintained equipment remains as efficient as before, as we know from old houses and automobiles. But changes in the

²² Solow et al. (1966).

²³ ‘Fixed assets and consumer durable goods in the United States 1925–1997’ by Shelby W. Herman, Arnold J. Katz, Leonard J. Loebach, and Stephanie H. McCulla with assistance from Michael D. Glenn (September 2003) US Department of Commerce.

²⁴ Solow et al. (1966).

environment, such as the reduction of hydro-electric output with the drying up of rivers and the depletion of raw materials will also reduce the value of output, though they are not included in standard growth models. Depreciation will occur even in a world of static real wages and, with climate change, the level of gross investment needed to maintain output has probably risen and is likely to be one explanation of why ‘we see productivity everywhere other than in the data’.

Companies are profitable even in economies with stagnant or declining output and, as I show, corporate savings vary with the growth of output.²⁵ ‘Creative destruction’ is an excellent description of the process whereby investment raises productivity through replacing old equipment which is scrapped with new and more efficient plant. Schumpeter’s insight helps our understanding of long-term growth but does not work as an explanation for trade cycles. Creative destruction does not require recessions and works most strongly when the economy is operating at full employment.

Output can be stagnant either because demand is suboptimal and there are unused resources of labour and capital, or because there is no growth in the capital stock under conditions of full employment, i.e. zero trend growth. In the model of Solow, Tobin et al. (1966), zero trend growth will be accompanied by zero increases in wages per head and, if this were the only cause for depreciation, it would fall to zero at zero growth. However, as noted above, it does not do so. Schumpeterian stagnation can end therefore in the SMM if companies expect a return on equity that matches the hurdle rate and invest to meet their expectations. In the SchM there are no profits without growth, output cost equals revenue both on average and at the margin. A change from stagnation to growth then requires companies to borrow, which is assumed to come from banks.

The SchM is thus in conflict with the data, which show that the profit share of output is constant, so the economy behaves in the medium term in accordance with the Cobb-Douglas production function.²⁶

In the SMM model investment will rise if the expected equity return on new investment rises and business savings will rise with the concurrent rise in expectations for growth.²⁷ Due to the exposure to the risk of inflation if debt is

²⁵ Smithers (2022), Chapter 4, and ‘Marginal productivity and the macroeconomic theories of distribution: comment on Samuelson and Modigliani’ by Nicholas Kaldor (1966) *Review of Economic Studies* 33, 4.

²⁶ The probability of the profit share of corporate output being mean reverting is shown by the near identity of the trend and averages of ratio as illustrated in Figure 42 of Smithers (2022).

²⁷ For a detailed explanation see Smithers (2022), Chapter 4.

borrowed short-term, companies prefer to borrow long-dated debt and the amount they borrow depends on the ratio of interest payments to profits, after depreciation but before interest and tax. Contrary to the SchM, no increase in bank borrowing is necessary.

Conclusions

It is unlikely that a rise in zombies in the USA this century has had any impact on business investment and growth and, as ‘... zombie firms are not a prominent feature of the US economy’²⁸ certainly no significant effect.

Three different attitudes or confusions seem to have contributed to the popularity of the idea:

- (i) Confusion between corporate default, balance sheet reconstruction and business liquidation. Business liquidation depends on the difference between operating and scrap value, which is unaffected by the level of interest rates.
- (ii) A misunderstanding of Schumpeter’s observation about creative destruction. Capital scrapping is most rapid when growth through rising labour productivity is strongest. The opposite is widely assumed and is sometimes used to argue that recessions help long-term growth.
- (iii) Well-justified worries about the damage done by ultra-low interest rates have led to a mistaken claim of guilt by association. Monetary policy has been disastrous, but it is innocent of the charge of slowing growth.

The point at which businesses become less valuable as going concerns than as scrap depends on their potential stock market value and on average this depends on the return on scrap value matching the hurdle rate. The CM assumes that business managers are indifferent to stock market values and assumes a relationship between short-term real interest rates, long-dated bond yields and equity returns, which is incompatible with other parts of the model.

The debate over zombies has the collateral benefit of demonstrating the need to replace the CM and the strength of the case for replacing it with the SMM.

²⁸ Favara, Minoiu and Perez-Orive (2022).

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Appendix 1

Brief Summary of the Models

The CM assumes that companies aim to maximise the present value of their net worth ('profit maximisation').

Companies therefore invest when the expected return exceeds the cost of capital, which is assumed to fluctuate with the real short-term interest rate, plus some allowance for risk, which is either fixed or varies with the perceived level of risk.

The cost of capital is not calculated from the data on returns to owners of capital and is assumed not to be directly observable but inferable either from the level of real short-term interest rates or from the level of investment.

The SchM assumes that in conditions of zero growth (stagnation) prices equal both marginal and average costs; the labour share of output is thus assumed to be 100% of output under conditions of zero growth. Investment to raise growth cannot therefore be financed from retained profits but must take the form of debt, which is assumed to come from banks. In conditions of full employment this will cause wages to rise and render new investment unprofitable. Growth can thus only arise if there are spare resources of labour.

The SMM shows that the cost of corporate capital can be calculated from the data on equity returns to shareholders and from those for leverage and interest payments.²⁹ These show that investment has not fluctuated with the cost of capital and thus that companies do not profit-maximise.

Companies invest if their expected returns on equity exceed the hurdle rate, which is stable over time and is the long-term real rate of return on equity to shareholders.

Corporate managers aim to maximise the present value of their companies as shown by the stock market rather than net worth. Their motive is to keep their jobs.

The crucial difference between these models is epistemological. The CM is a purely *a priori* model which cannot be tested in its own terms as the returns from financial markets are defined as being consistent with the level of investment. It was developed before long-term data on the cost of capital

²⁹ Corporate data on leverage are published in Table B 103 of the Federal Reserve's Financial Accounts of The United States Z1 and those on interest payments in the BEA's National Income and Product Accounts ('NIPA') Table 1.14.

became available from data on financial markets and, being untestable, fell the wrong side of Karl Popper's demarcation between science and non-science.³⁰ Now that such data are available the CM is testable and shown to be invalid. As it is inconsistent with these data, adherents of the CM must ignore them or claim that they are wrong. In practice I have found that most economists choose to avoid discussion over the validity of different models. I attribute this not only to the well-known sociological opposition to major changes, termed paradigm shifts,³¹ but to nervousness about entering debates on issues of epistemology. Welcome exceptions to this include George Akerlof, Ricardo Caballero, Doyne Farmer,³² and Steven Medema and Warren J. Samuels who comment adversely on '... the neo-classical research protocol requiring the production of unique determinate optimal equilibrium proposals and the correlative making of those assumptions, such as given fixed preferences and utility, or profit maximisation, necessary to produce such solutions'.³³

Evergreening differs from the CM and shares with the SMM the assumption that corporate managers have their own utility preferences and put their own interests ahead of profit maximisation, which the CM assumes to be in the interests of their shareholders. The authors (Faria-e-Castro, Paul and Sánchez, 2022) seem to assume that this is a rare event which does not invalidate the use of the CM to arrive at estimates of profit margins derived from company accounts but, if they do, the assumption seems unjustified. As it seems impossible to derive productivity data from company accounts without complicated modelling which appears to follow the CM, my tentative conclusion is that Evergreening is an incoherent model.

That scientists often fall into epistemological error has been noted by prominent physicists.³⁴ It is unfortunate that, even more often than other sciences, economics is pursued unscientifically.

³⁰ *The Logic of Scientific Discovery* by Karl Popper (1959) London: Hutchinson & Co.

³¹ *The Structure of Scientific Revolutions* by Thomas S. Kuhn (1962) University of Chicago.

³² As noted in 'The stock market model: a new foundation for economic and monetary policy' by Andrew Smithers *American Affairs Journal* Summer 2022 VI, 2.

³³ Afterword (p. 322) to *A History of Economic Thought* by Lionel Robbins (1998) Princeton University Press.

³⁴ 'Beyond the quantum horizon' by David Deutsch and Artur Ekert (2012) *Scientific American*, September.

Appendix 2

National and Corporate Accounting

There are many differences between profits, depreciation and asset values as published in corporate and national accounts.

- (i) In national accounts the income, output and expenditure data must add up to the same totals and, with minor deviations, they do. There is no such control for corporate accounts and the sum of individual companies' profits and assets has clearly differed sharply from national data, as the divergence has varied sharply over time.
- (ii) Differences inevitably arise from fluctuations in inflation as national accounts allow for their effects and corporate accounts do not.
- (iii) Periods of profit overstatement often require write-offs to asset values but can also be used to boost subsequent profits. The change in management remuneration in the 1990s led, *inter alia*, to a dramatic rise in the volatility of corporate profits relative to those in the national accounts.³⁵ In bad years, such as 2008, corporate profits are depressed by write-offs, which boost profits in subsequent years.

Not only are national accounts more reliable than corporate ones, but the divergence has become more pronounced this century. Where there are conflicts between the two sources national account data should clearly be preferred.

³⁵ See Figure 45 and the accompanying explanation in Smithers (2019).