



BANK OF ENGLAND

Speech

Achieving a sustainable recovery: where next for business investment?

Speech given by

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Introduction

This morning, the ONS released its latest Labour Force Survey data, which showed that unemployment fell, in the three months to November, to 7.1%. In recent months, the unemployment data have been increasingly scrutinised, not least in the context of the Monetary Policy Committee (MPC)'s current forward guidance, which binds us not to reduce monetary stimulus until unemployment falls to at least 7%, as long as the Bank of England's inflation and financial stability objectives are not put at risk.

As we approach the 7% threshold, I am sure speculation is bound to increase about what we might do when the threshold is reached. Once we get there, we will say more, but for now, let me reiterate what we said in the Minutes of our January meeting, also published this morning.

Alongside the recovery in the economy and that fall in unemployment, we have also seen a reduction in the rate of inflation, to 2%, and cost pressures remain subdued. It is therefore worth restating that the 7% unemployment level is only a threshold, not a trigger, and that the MPC sees no immediate need to increase interest rates even if 7% were to be hit in the near future.

It is also the case that the recovery is still in its early stages, and the headwinds to growth linked to the financial crisis are likely to persist for some time yet. So it is also likely that, when the time does come to reduce the current degree of stimulus, it would be appropriate to do so only gradually. In terms of the objectives of forward guidance, these two messages are important. One of the prime objectives of our guidance strategy has been to reduce uncertainty and bolster confidence for businesses and consumers to help support the recovery, especially in its early stages.

That greater confidence and certainty is particularly important for the subject of my speech tonight – the prospects for a pickup in business investment. Business investment is a crucial element in the recovery. It does not just contribute to cyclical fluctuations in the economy; as the means by which the stock of capital accumulates, it also influences the productive capacity of the economy and long-term trends in growth.

The UK economy has staged a remarkable upturn over the past year, but so far business investment has remained weak, leading some commentators to judge that we are seeing the “wrong sort” of growth – too much reliance on consumption and housing, not enough on investment and exports, is what I hear frequently. Many seem puzzled by the fact that business investment has yet to pick up, as if this represents a major fault in the recovery process.

Today I would like to dispel the misconception that business investment drives economic recoveries – that it leads the economic cycle. Rather, as I will argue, its rightful place in the recovery is as a lagging, or late cycle, contributor to growth. In other words, a broad-based recovery in activity – which must mean a recovery in household spending, which accounts for 60% of gross domestic product (GDP) – is a prerequisite for a

recovery in business investment, not the other way round. I will also argue that, in this upswing, there are good reasons why the investment recovery might take a little longer to get going than in other, more normal, cycles.

None of this is to belittle the importance of business investment to growth: a recovery in business investment is a precondition for a *sustained* wider recovery. The pace of the pickup in investment – when it comes – will ultimately determine the duration of the present upswing. But to criticise the business sector for not having increased its investment already, after only three quarters of respectable growth in the economy, seems to me premature, and misguided.

What exactly does business investment encompass? Over the past thirty years, we have seen a wholesale restructuring of the UK economy, away from manufacturing towards service activities, and this significantly changes the way we need to think about business investment and its contribution to the economy.

According to the Office for National Statistics (ONS), business investment accounts for about eight percent of GDP and consists of spending on machinery and plant, transport equipment, commercial property and software. Yet it is important to recognise that other types of spending, which you and I might think of as business investment in a modern economy, are not treated as such in the national accounts. For example, spending by companies on business services, such as advertising, falls under the category of intermediate consumption, and the contribution of such spending to final demand (what is captured in GDP) primarily shows up as household consumption and exports rather than investment. Some consulting services appear as investment, but others are recorded as final consumption. And spending on Research and Development (R&D) has been treated as intermediate consumption in the national accounts, rather than as business investment. So it is welcome news that in the next Blue Book, to be published later this year, the ONS will for the first time record R&D as investment spending, allowing it to contribute directly to GDP. It is also worth pointing out that spending on intangible assets, an increasingly important part of companies' capital expenditure which is included in the official definition of business investment, is believed to be under-recorded in the national accounts.¹

Even after setting aside these measurement issues, business investment remains one of the most difficult output components to analyse and forecast. Ten years at the Confederation of British Industry taught me that investment models based on profit maximisation and the cost of capital only explain a small part of investment dynamics. Of course investment decisions will be affected by expected profits, marginal tax rates, the relative price of investment goods, the cost (and availability) of external funding, and internal funds. But I believe that neoclassical-type models miss an important factor, which has played a substantial role in driving

¹ One partial explanation for the weakness of productivity advanced by Goodridge et al (2013) is that the increase in intangibles investment since the financial crisis has been under-recorded and has not been matched by a commensurate increase in value added. More generally, the mis-measurement of intangible investment is primarily a supply issue, since it implies that the stock of capital is higher than estimated.

the current investment cycle – uncertainty.² Changes in uncertainty and ‘animal spirits’ are a critical determinant of how businesses themselves think and behave, and, more importantly, provide a better understanding of the likely outlook for investment.

Recent developments in business investment

Business investment fell sharply during the financial crisis of 2008-2009, to a level some 30% below its pre-crisis peak by late 2009, according to the latest ONS estimates. Even based on the previous vintage of ONS data (“pre Blue Book” for those in the know), which are much less volatile, the peak-to-trough gap was estimated to have been about 23%, bigger than that seen in the early 1980s and 1990s recessions (**Chart 1**). Since the trough, business investment has remained depressed, with the level in the third quarter of last year still about 26% below its pre-recession peak, considerably weaker than at the same stage in previous cycles – although, again, differences with previous recessions are exacerbated by the volatility of this vintage of the data.

Early data estimates are, of course, tentative, and I suspect some of that weakness in 2013 will be revised away, but the narrative remains one of a collapse in business investment and only a feeble recovery to date.

So why has business investment been so weak? To answer that question and get a handle on what the recovery might look like, we need to look at what happened during the crisis and its aftermath.

The financial crisis of 2008-2009 is best characterised as a large negative demand shock – a shock to the level of activity. A number of factors have been identified as the root cause: the mispricing of risk, financial innovation coupled with lax regulation and excessive leverage.³ Balance-sheet repair by households, businesses and banks, together with fiscal consolidation, has weighed on activity here and in other advanced economies in recent years. But it is the proximate triggers of the crisis that precipitated the negative demand shock: the failure of several banks, and the associated seizing up of money and credit markets, brought about a collapse of business and consumer confidence – so-called ‘animal spirits’ – and with it private spending and world trade.

Yet it is not just the level of activity that was hit – firms, consumers and investors did not just become more pessimistic about the future and cut down their spending. They also became much more uncertain about it, facing a wider range of possible outcomes. The heightened degree of uncertainty caused by the banking crisis was then compounded in 2011-12 by the escalation of the sovereign debt crisis within the Eurozone. This combination of pessimism and heightened uncertainty represented a major shock to animal spirits, causing companies and households to retrench sharply.

² Jorgensen (1963) articulates the tenets of the Neoclassical model in “Capital theory and investment behavior”.

³ See, for example, King (2012).

In practice, it can be difficult to distinguish between confidence and uncertainty. For example it is possible that survey measures of uncertainty, such as the CBI's question on factors limiting capital spending, which includes a category on 'uncertainty about demand', capture firms' lower average expectations about the future state of the economy as well as the greater variance around these expectations. Purer proxies of firms' economic uncertainty, such as implied stock market volatility and the dispersion of company earnings forecasts, also tend to move closely with shifts in confidence (**Chart 2**).

But that does not mean it is impossible to disentangle the respective effects of uncertainty and confidence on economic activity. A recent empirical study for the UK shows that uncertainty shocks have a statistically significant negative impact on GDP, even after controlling for confidence.⁴ And although uncertainty shocks tend to be short-lived,⁵ the unprecedented size and duration of the increase in uncertainty during the financial crisis, and the fact that it came in several waves, suggests that uncertainty is likely to have played a significant role in depressing activity over the past five years. In other words, persistent uncertainty is likely to have had a persistently depressing impact on output.

For business investment, the mechanism by which a rise in uncertainty operates is simple. Because investment is costly to reverse, when a firm decides to undertake a project, it gives up the option of waiting to gather more information. But that option has a value, which increases with the level of uncertainty about future conditions.⁶ So to give up this "option to wait", a firm will require a higher rate of return from investment, net of costs, as compensation. In other words, uncertainty reduces the incentive to invest by pushing up on the opportunity cost of undertaking an investment project. So it is not surprising that, in business surveys, when firms are asked which factors are restraining capital spending, 'uncertainty about future demand' is quoted by the greatest number of firms (**Chart 3**).

'Animal spirits' and reduced uncertainty as a prerequisite for an investment recovery

So, any recovery in business investment will require not only a pickup in final demand, but a sustained decline in uncertainty. There are encouraging signs that this is now happening. Indicators of uncertainty derived from stock-market volatility and company earnings forecasts have been gradually receding since late 2011, and the CBI's measure of demand uncertainty had edged down markedly since the middle of last year (**Chart 2**). Absent adverse developments in the euro area, uncertainty should continue to decline. Business confidence too has been on the mend over the past couple of years, and the pickup in economic activity of recent quarters should continue to support that improvement.

Indeed, investment intentions have picked up since late last year and paint a rather rosier picture of business investment growth than the latest vintage of ONS data (**Chart 4**). These survey measures have in the past

⁴ See Haddow et al (2013).

⁵ For example, Bloom (2009) contrasts the "rapid slowdown and bounce-back" generated by uncertainty shocks with the "much more persistent slowdown" associated with demand shocks.

⁶ See Dixit and Pindyck (1994).

been a close match for final estimates of business investment,⁷ so, as I said earlier, I suspect that in time the official data will be revised up and align better with the surveys, to show that we are now in the very early stages of an investment recovery.

The role of corporate finance: external vs internal

The second critical driver of corporate investment is financing conditions.

The credit crunch resulted in a sharp decline in finance raised by UK private non-financial companies (PNFCs) (**Chart 5**), reflecting both lower demand for funds and constraints on the supply of bank lending. With commercial banks, under pressure to repair their own balance sheets, less willing to extend loans, the relative importance of corporate loans on UK PNFCs' balance sheets has declined since the onset of the recession (**Chart 6**).

This dearth of bank lending has no doubt been a factor holding back business investment. But the relationship between bank financing and investment is more subtle than the aggregate numbers suggest. Different firms tend to rely on different forms of finance, so the link between bank finance and business investment may not be as direct as sometimes perceived.

Some firms have turned to alternative sources of finance, raising funds from public markets. Annual gross bond issuance by UK PNFCs rose to its highest level since the data was first collected in the 1980s, as firms benefitted from strong investor appetite for higher yields in a low interest rate environment (**Chart 7**).⁸ And over the last five years, an estimate of the proportion of UK companies issuing a bond for the first time has increased sharply compared to the five years prior to the crisis (**Chart 8**). But such financing is restricted to very large firms - almost all individual bond issues since 2009 have been greater than £50mn.

In terms of their contribution to investment, the large firm sector (including both public and private companies) is particularly important, contributing around 65% to net capital expenditure⁹, and for these firms there are encouraging signs. Intelligence from market contacts suggests that debt market conditions are improving, such that firms are increasingly raising debt capital in order to refinance at a lower cost of funding or build up cash reserves to take advantage of future investment opportunities, rather than simply because they need to fill a funding hole. This may point to an increased ability to invest.

At the other end of the scale, the very smallest businesses have only limited recourse to bank finance. About half of firms with fewer than 50 employees do not use mainstream external corporate financing and, of

⁷ See Barnes and Ellis (2005).

⁸ This includes all-credit UK PNFC-issued bonds in all currencies. See Farrant, Inkinen, Rutkowska and Theodoridis (2013).

⁹ ONS Annual Business Survey 2012, which covers only the UK Non-Financial Business Economy which accounts for approximately two thirds of the UK economy in terms of Gross Value Added.

those that do, around a fifth have an overdraft, loan or credit card in their own name.¹⁰ As a result, they will have been less directly affected by the reduction in corporate bank lending since 2009.

In the middle are the majority of firms, small and mid-size, which are more reliant on banks. These have clearly been externally financially constrained through the crisis. So it is welcome that, for smaller firms, conditions now seem to be improving, although this improvement is less clear for medium-sized firms (**Chart 9**). But while these firms have faced the biggest deterioration in their access to external finance, they are also the category that finances investment most heavily from internal funds.

Internal funds, generated through retained earnings, are an important, and often overlooked, source of funding for investment for all firms. A simple accounting of ONS net financing flows over the past ten years shows that long-term funding raised by UK PNFCs from external sources has not been sufficient to fund aggregate business investment.¹¹ While the exact matching of sources and uses of financing is uncertain, this seems to imply that, in an average year, firms have relied on internal funds for at least 60% of UK business investment, particularly so following the crisis (**Chart 10**). And, in my experience from talking to businesses, these retained funds are likely to be even more important for those firms with limited sources of external finance. Evidence from micro data on listed firms supports this – there is a strong correlation between the cash profits and investing cash flows of these “middle-tier” firms without bond market access (**Chart 11**). And over the last 20 years, the median listed firm without bond market access has on average generated sufficient cash from its operations in an average year to cover more than 80% of its capital expenditure.

The important role of retained earnings is consistent with the so-called pecking order theory of corporate finance, where internal financing is preferred as it is cheaper than raising funds externally.¹² It is also consistent with how companies appear to operate in practice. From my conversations with company finance directors, it is apparent that most firms do not consider investment decisions in the way that economists describe – that is that investment will be undertaken as soon as the marginal return exceeds the marginal cost of capital, and that borrowing levels are subordinate to that. In practice, for most companies, the total amount of external debt raised (the level of ‘gearing’) is strategically set at some pre-determined level – trading off the benefits of extra debt with the risk of going insolvent – leaving investment decisions more dependent on the amount of internal funds available.

¹⁰ SME Finance Monitor Q3 2013, BDRC Continental.

¹¹ UK business investment will also include investment by financial intermediaries (not included in PNFC financing flows) although this accounts for a very small portion of total business investment (around 5% in 2012).

¹² According to the pecking order theory, external investors have less information about the firm than managers, and so demand an external financing premium. Firms have a strict preference for internal funding, followed by debt and then equity. Equity is least preferred as it would risk signalling to those outside the firm that such financing is cheap and the company is over-valued. See Majluf and Myers (1984).

Pension deficits and investment

But since 2008, the availability of internal funds has been constrained by more than the normal cyclical behaviour of profits. For many companies, pension deficits widened through the financial crisis as equity markets fell, discount rates were reduced and estimates of pensioner longevity increased.¹³ As a response, many companies have had to increase their annual pension contribution, representing another call on retained earnings. With gearing levels set, for many companies, independently, this has increased the effective competition between investment and other uses for available internal funds.

Micro data show that listed firms which reported pension deficits have spent less on investment as a proportion of their assets following the onset of the crisis, particularly in 2012 when deficits rose sharply (**Chart 12**). And there is some evidence to suggest that for firms whose external financing is constrained, the rise in pension deficits has weighed on investment by more than for firms with no deficit. This may be due to the increased uncertainty that comes with having a pension deficit – raising questions around how much and when a firm will have to pay to fill the gap. But it may also imply that having a pension deficit borne out of changes in broad financial market conditions means that a firm has less retained earnings to finance capital expenditure.

It is difficult to know with confidence which explanation is more binding. But in either case, the link between pension deficits and investment seems to be important. This is confirmed by a recent survey of companies with defined benefit pension schemes by the Bank's Agents. Twenty-four percent of the firms surveyed, the majority of which had a scheme in deficit, reported a major impact on investment decisions, with a further 28% reporting a minor impact.

In summary, access to external credit is clearly important in determining financing conditions for investment, but I do not think it tells the full story. Bank loans remain an important source of finance for firms, for which the Funding for Lending scheme is and will continue to play a significant part. But the role of retained funds in financing investment should not be overlooked. The recovery in animal spirits should encourage firms to dip into their retained profits to finance investment, supplementing the gradual improvement in external credit conditions. And the recent rise in bond yields will be a welcome relief for those firms suffering under the weight of pension deficits.

¹³ Some of the change in pension deficits will be due to QE, but this is likely to be small compared to other factors impacting on deficits over this period, such as the collapse in equity prices at the start of the financial crisis. And QE will have benefitted the broader corporate sector, by lowering the cost of finance, encouraging households to spend more and boosting confidence by removing some of the worst downside risks. See Bean (2012) for a full discussion.

Anatomy of the business investment recovery

So conditions are falling in place to support a recovery in business investment – funding, both internal and external, has become more readily available, uncertainty about future demand has fallen and confidence about the economic outlook more generally has picked up. But while these conditions are all necessary for companies to be able to invest, they are not in themselves fully sufficient for a recovery to get started.

The one-way nature of investment – once done it is difficult to undo – means in practice that there is a bias to not investing. Put another way, businesses only invest when they feel compelled to do so – when they need to replace an aging capital stock, expand their production capacity or keep up with competitors. So, even as demand picks up and financing conditions improve, making the realisation of investment plans possible, companies will in the first instance adopt a ‘make do and mend’ approach – stretching their capital utilisation by repairing aging pieces of equipment, working their existing staff more effectively and so on – before investing in new capital. This is an additional reason why business investment picks up several quarters after whole-economy activity and the achievement of “normal capacity” working. **Chart 13** shows that investment today has the highest correlation with GDP one to two quarters ago, or, put another way, that GDP today gives on average a reasonable indication of where business investment will be in the middle of the year (also see Broadbent (2014)).

A further cross check on when capacity levels start to drive investment comes from the capital/output ratio. Over the past twenty years, there appears to have been a steady decline in the ratio consistent with full capacity working (**Chart 14**), as the capital intensity of the economy has fallen, probably as a result of the growing importance of the service sector in GDP. The changing nature of investment in recent years (towards shorter life assets) makes the choice of depreciation rate needed to estimate the current capital/output ratio more uncertain, but at a reasonable depreciation rate it seems likely that the economy should return to a capital/output ratio consistent with full capacity working over the course of the next 12-18 months. This should provide a further incentive for companies to invest, at least for replacement purposes to offset further depreciation.

Survey evidence suggests that over the past three years, companies that have been investing have done so mainly to replace equipment – and to a greater extent than usual – rather than to expand capacity (**Chart 15**). That replacement motive for investment has been particularly prevalent in the services sector (excluding financial services). This is consistent with the need to replace aging equipment, particularly in vehicles and IT, as companies stretched out their rolling replacement programmes during the financial crisis.¹⁴

¹⁴ In the United Kingdom, no data exist on the average age of the capital stock, although the introduction of computer technology has reduced the life length of some constituents of equipment capital, for example to five years for computers. See ONS (2010).

The need to replace existing assets continues to underpin investment plans, but companies are also reporting that they intend to invest to expand capacity.

That chimes with the steer from survey measures of capacity utilisation. Survey responses suggest that companies are now operating at normal capacity (shown by the position of the swathe relative to the zero line in **Chart 16**). Analysis of answering practices to such surveys indicates that there is a subtle difference between normal utilisation and absolutely full capacity,¹⁵ suggesting that a modest increase in demand could still be accommodated within existing fixed capacity. However, we now appear close to the point at which additional investment will be required to cope with future increases in demand, explaining the reasonably good leading relationship between survey measures of capacity utilisation and business investment (**Chart 17**).

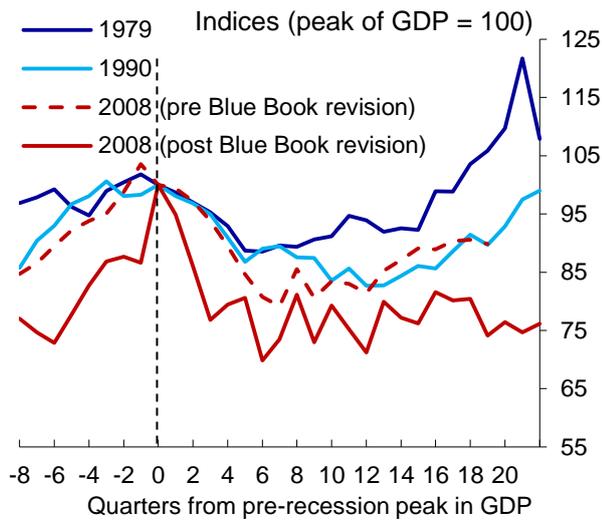
Another, more prosaic, factor will in due course encourage businesses to invest: the need to keep up with competitors. As the recovery becomes more entrenched, finance directors will naturally become more watchful of their rivals' investment plans and market-share strategies, engaging in a virtuous circle of matching their investment plans with that of competing firms.

Conclusion

The conditions needed for a recovery in business investment are finally falling in place. Confidence and certainty about the economic outlook and consumer demand have improved, as has access to internal and external sources of finance. This is laying the ground for businesses to start investing to replace obsolete capital, increase existing capacity and keep up with competitors. Only then will investment take its rightful place in the recovery, broadening final demand. I suspect that this may still be a little time in coming, and that more rapid investment growth may not show through until later this year and into 2015 – as I said, business investment is a late-cycle phenomenon. But it is worth the wait. Rising business investment should help restore productivity growth amongst the labour force, leading to higher real wages and more sustainable growth in consumption. That is the definition of a sustainable recovery, something to which we all aspire.

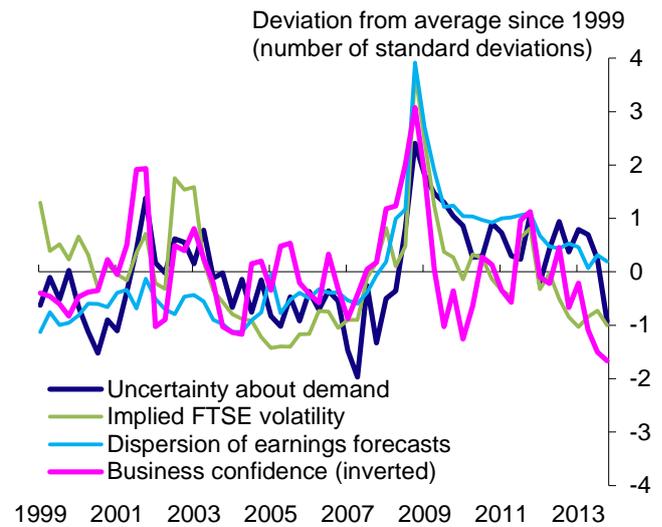
¹⁵ Analysis of the CBI Industrial Trend Survey shows that respondents deem normal capacity working to be around 90% of absolutely full capacity.

Chart 1: Levels of business investment



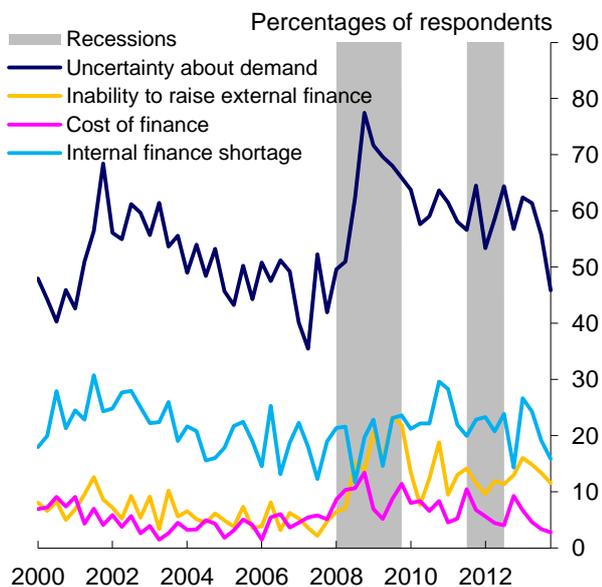
Source: ONS and Bank calculations.

Chart 2: Indicators of business uncertainty and confidence



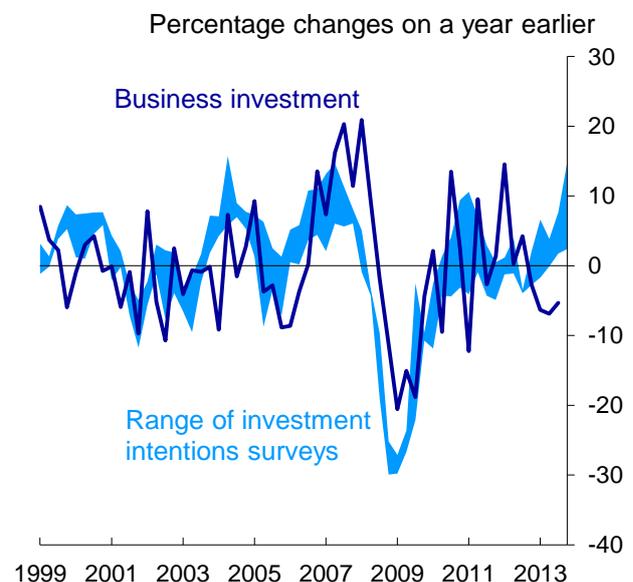
Source: CBI, LIFFE, IBES and Bank calculations. Manufacturing, financial services and consumer/business services surveys weighted by shares in real business investment. Three-month option-implied volatility of the FTSE All-Share index. Standard deviation of analysts' forecasts for earnings growth over the next twelve months.

Chart 3: Factors likely to hold back investment



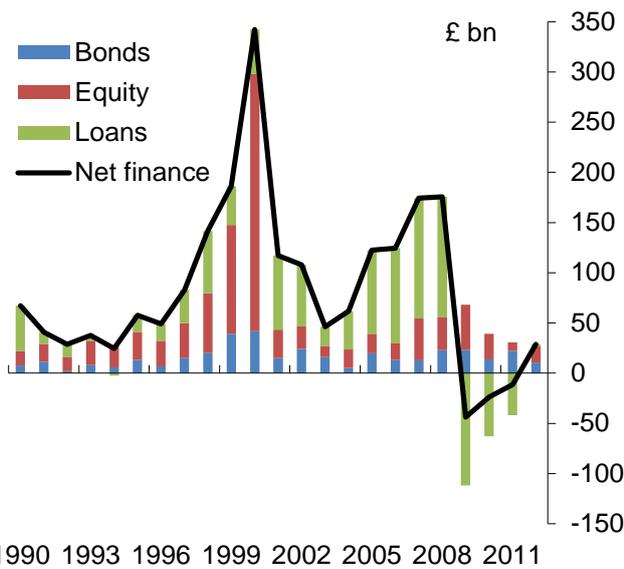
Source: CBI, ONS and Bank calculations. Manufacturing, financial services and consumer/business services surveys weighted by shares in real business investment.

Chart 4: Business investment and surveys of investment intentions



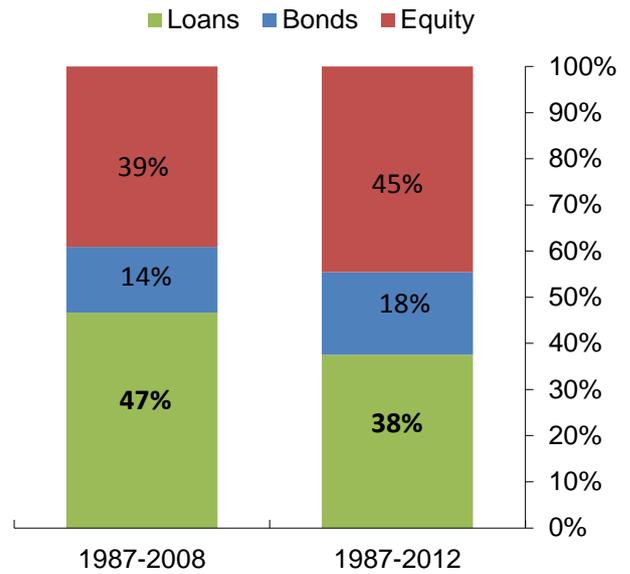
Source: ONS, Bank's Agents, BCC, CBI and Bank calculations.

Chart 5: Net external finance raised by UK PNFCs



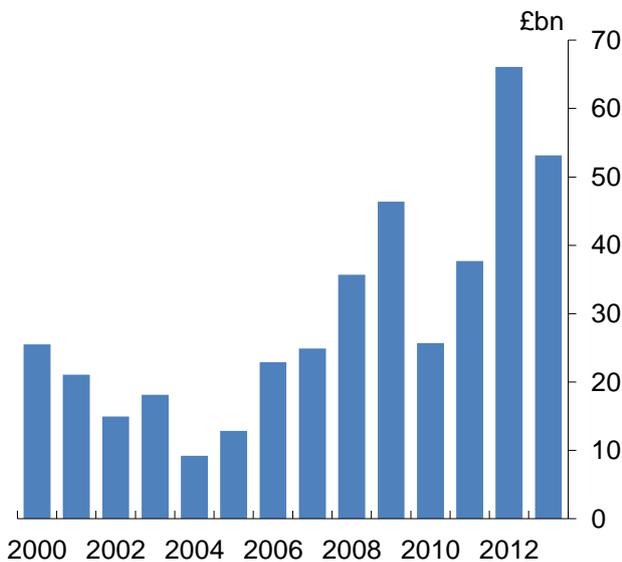
Source: ONS Financial Account for UK PNFCs and Bank calculations. Equity includes both quoted and unquoted shares.

Chart 6: UK PNFC's sources of external finance



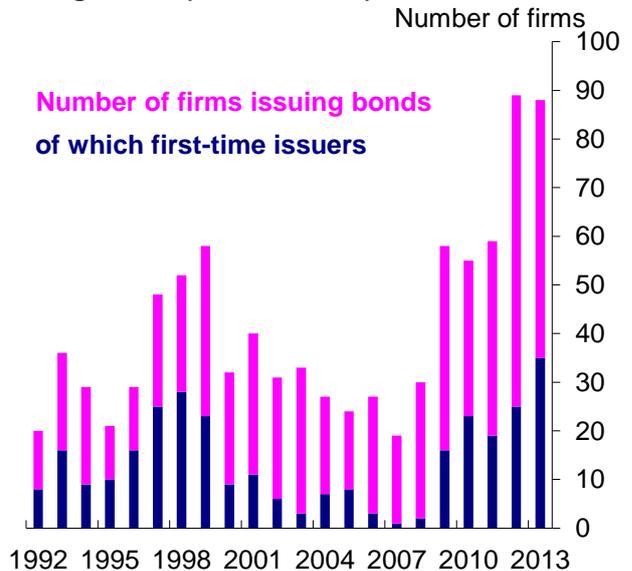
Source: ONS Financial Account for UK PNFCs and Bank calculations. Equity includes both quoted and unquoted shares. Proportions based on cumulative net finance raised since 1987 and shown at nominal value.

Chart 7: Gross bond issuance by UK PNFCs (all currencies)



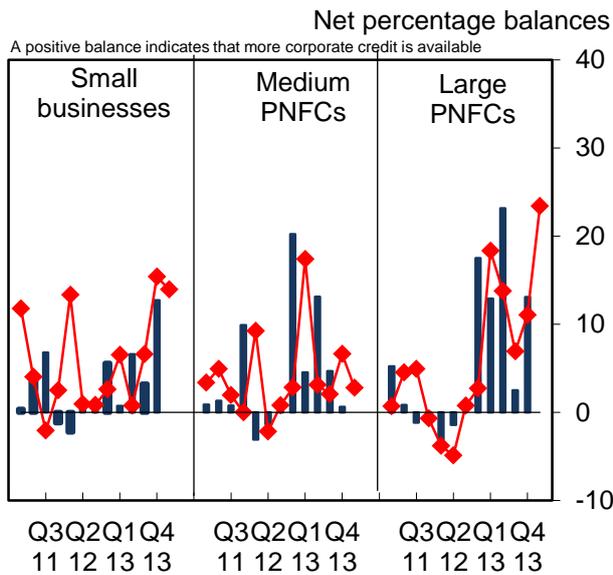
Sources: Dealogic and Bank calculations.

Chart 8: Estimate of the number of UK PNFCs issuing bonds (all currencies)



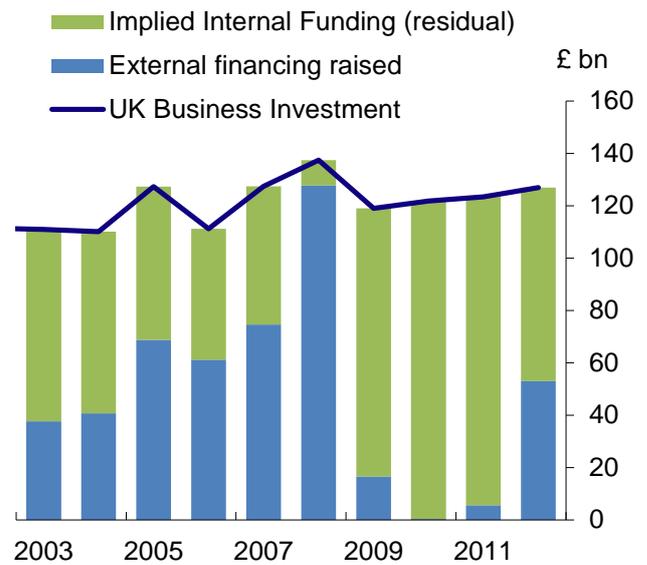
Sources: Dealogic and Bank calculations.

Chart 9: Corporate credit availability by firm size



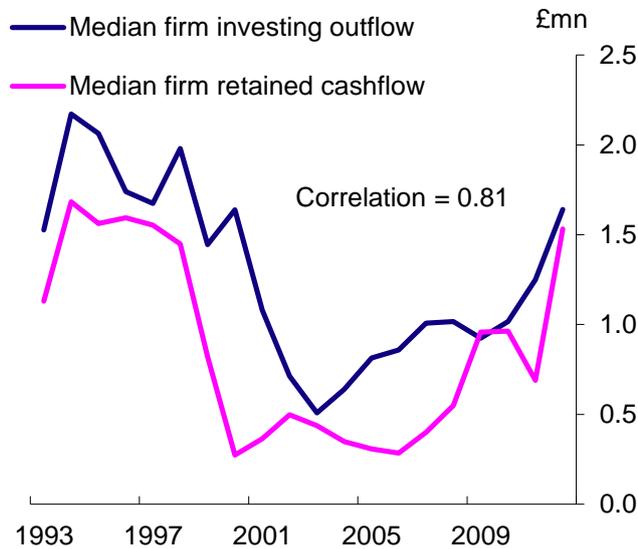
Net percentage balances are calculated by weighting together the responses of those lenders who answered the question. The blue bars show the responses over the previous three months. The red diamonds show the expectations over the next three months. Expectation balances have been moved forward one quarter so that they can be compared with the actual outcomes in the following quarter.

Chart 10: External finance raised versus UK business investment



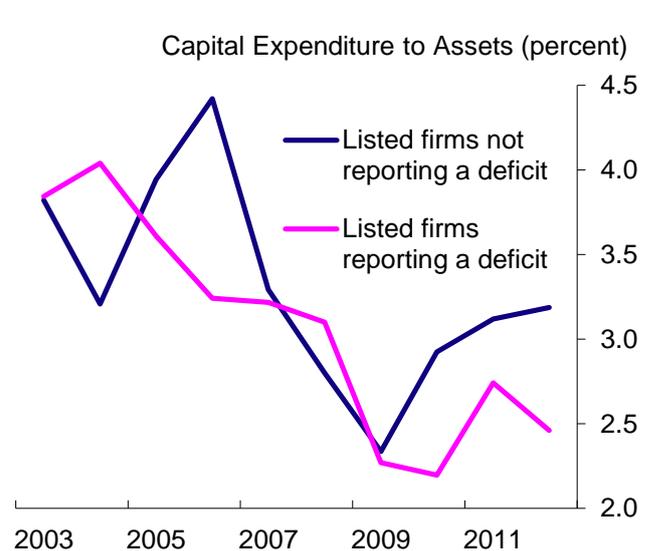
Source: ONS and Bank calculations. External financing consists of long term debt and both quoted and unquoted equity raised.

Chart 11: The investing and retained cash flows of listed UK PNFCs without bond market access



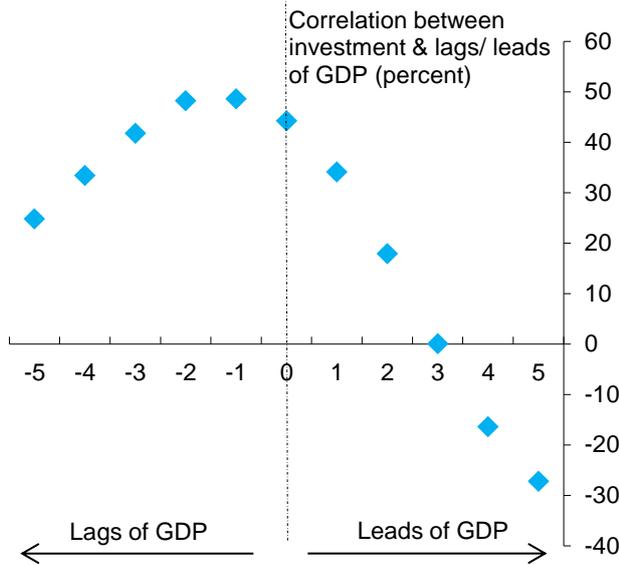
Source: Thomson Reuters Datastream Worldscope and Bank calculations. All listed UK PNFCs excluding extractive sector. Retained cash is cash generated from operations less dividends paid. Investing outflows is net cash flow from investing. A firm without bond market access is defined as never having issued a bond between 1989 and 2012.

Chart 12: Investment by listed UK PNFCs with and without pension deficits



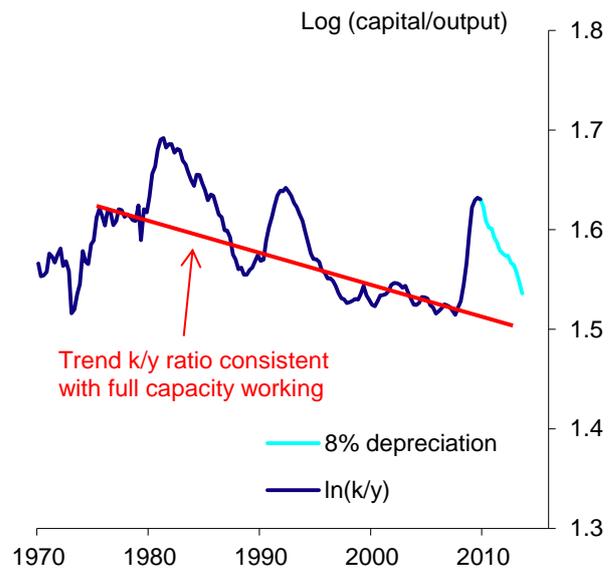
Source: Thomson Reuters Datastream Worldscope and Bank calculations. The sample includes all listed UK PNFCs excluding extractive sector that reported a value for item 18821 "Net Pension Liability / (Asset)" in Thomson Worldscope.

Chart 13: Cross-correlations between the cyclical components of business investment and GDP



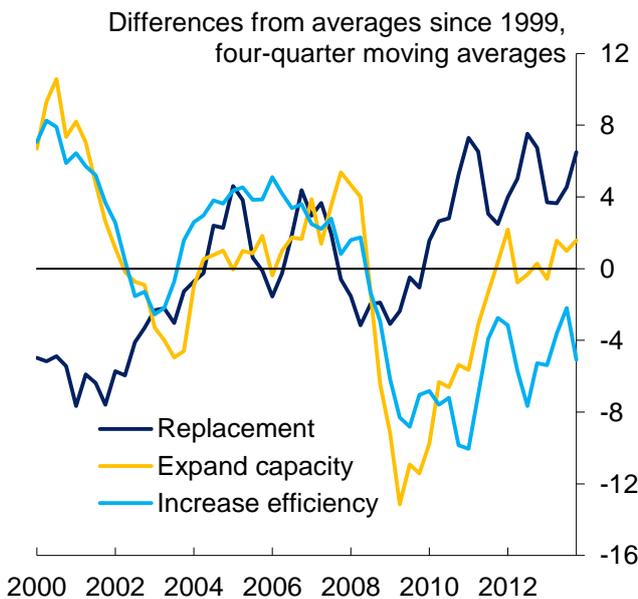
Source: ONS and Bank calculations. Cyclical components are obtained by applying a Hodrick-Prescott filter to business investment and GDP over 1970Q1-2013Q3 (smoothing parameter 1600).

Chart 14: Capital-output ratio



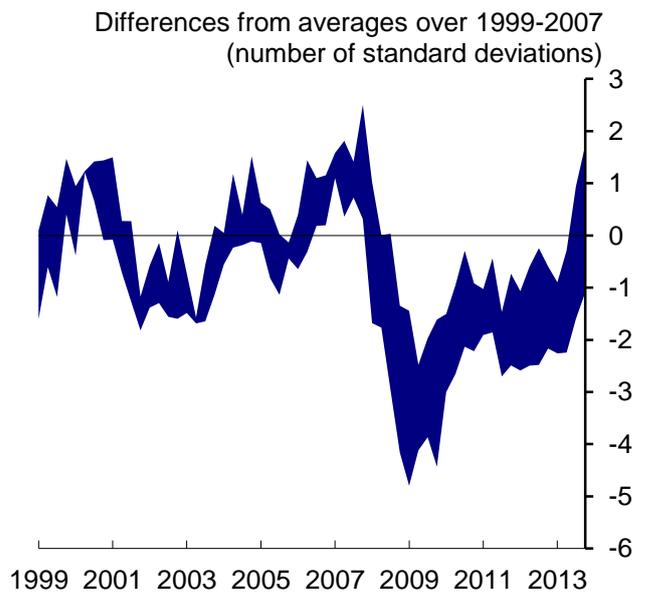
Capital output ratio based on Wallis (2012), "Essays in understanding investment". From 2010 estimates of capital are generated using the Perpetual Inventory Method.

Chart 15: Reasons for investment



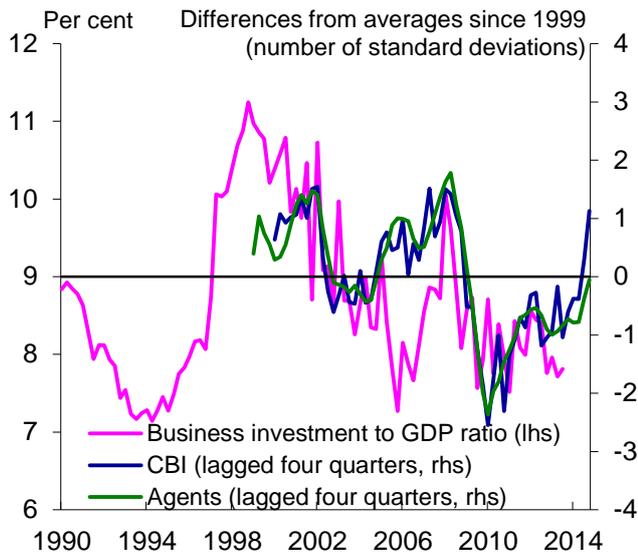
Source: CBI, ONS and Bank calculations. Companies are asked for the reasons for capital expenditure over the next twelve months. Manufacturing, financial services and consumer/business services surveys weighted by shares in real business investment.

Chart 16: Capacity utilisation surveys



Source: Bank of England, BCC, CBI, CBI/PwC and ONS.

Chart 17: Capacity utilisation surveys and business investment



Source: Bank of England, BCC, CBI, CBI/PwC and ONS.

References

- Bank of England (2014)**, *Credit Conditions Survey*, 2013 Q4, available at <http://www.bankofengland.co.uk/publications/Documents/other/monetary/ccs/creditconditionsurvey140108.pdf>
- Barnes, S and C Ellis (2005)**, 'Indicators of short-term movements in business investment', Bank of England *Quarterly Bulletin* (Spring 2005).
- Bean, C (2012)**, 'Pension funds and quantitative easing', speech given at The National Association of Pension Funds' Local Authority Conference, Cotswold Water Park Four Pillars Hotel, Gloucestershire, 12 May, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2012/speech573.pdf>
- Bloom, N (2009)**, 'The impact of uncertainty shocks', *Econometrica*, Vol. 77, pages 623–85.
- Broadbent, B (2014)**, 'The balance of growth', speech given at the London School of Economics, 17 January, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech702.pdf>
- Dixit, A and R Pinkyck (1994)**, Chapter 2 of *Investment Under Uncertainty*, Princeton University Press, Princeton.
- Goodridge, P, Haskel, J and G Wallis (2013)**, 'Can intangible investment explain the UK productivity puzzle?', Discussion paper 2013/2, Imperial College Business School, May 2013, available at <http://spiral.imperial.ac.uk/bitstream/10044/1/11140/4/Haskel%202013-02.pdf>
- Farrant, K, Inkinen, M, Rutkowska, M and Theodoridis, K (2013)**, 'What can company data tell us about financing and investment decisions', Bank of England *Quarterly Bulletin* (Winter 2013).
- Haddow, A, Hare, C Hooley, J and T Shakir (2013)**, 'Macroeconomic uncertainty: what is it, how can we measure it and why does it matter?', Bank of England *Quarterly Bulletin* 2013 Q2, available at <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2013/qb130201.pdf>
- Jorgenson, D (1963)**, 'Capital theory and investment behavior', *American Economic Review*, Vol.53, pp.247-59.
- King, M (2012)**, 'The 2012 BBC Today Programme Lecture', London, 2 May 2012, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2012/speech567.pdf>
- Majluf, N and S Myers (1984)**, 'Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have', *Journal of Financial Economics*, Vol. 13, No. 2, 1984, pp. 187-221.
- Office for National Statistics (2010)**, 'Capital Stocks, Capital Consumption and Non-Financial Balance Sheets', available at <http://www.ons.gov.uk/ons/rel/cap-stock/capital-stock--capital-consumption-and-non-financial-balance-sheets/2010-results/index.html>
- SME Finance Monitor Q3 2013**, 'The rise of the non-seeker of finance', BDRG Continental, November 2013, available at <http://www.sme-finance-monitor.co.uk/>
- Wallis, G (2012)**, 'Essays in Understanding Investment'.