

# THE FINANCIAL CRISIS, BANK LENDING AND UK PRODUCTIVITY: SECTORAL AND FIRM-LEVEL EVIDENCE

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This paper assesses the evidence and investigates some of the mechanisms by which the most recent banking sector crisis might have affected the supply side of the UK economy. We find clear evidence that the banking sector crisis affected credit supply to businesses and caused bank lending to decline. But we do not find much evidence of the heterogeneity in performance between different industrial sectors that would have been expected if banking sector impairment had been the key factor holding back productivity growth. Consistent with this we do not find strong evidence that a lack of reallocation of resources across businesses has been a substantial drag on productivity growth.

Keywords: credit; productivity; recession

JEL Classifications: B22; D24; E34; G21

## I. Introduction

There is a range of cross-country evidence suggesting that long-term growth potential is damaged by major recessions associated with financial crises (Reinhart and Rogoff, 2011). Oulton and Sebastia-Barriel (2013) estimate that each year of a banking crisis reduces output per hour worked by around 1 per cent for each year that the crisis lasts.

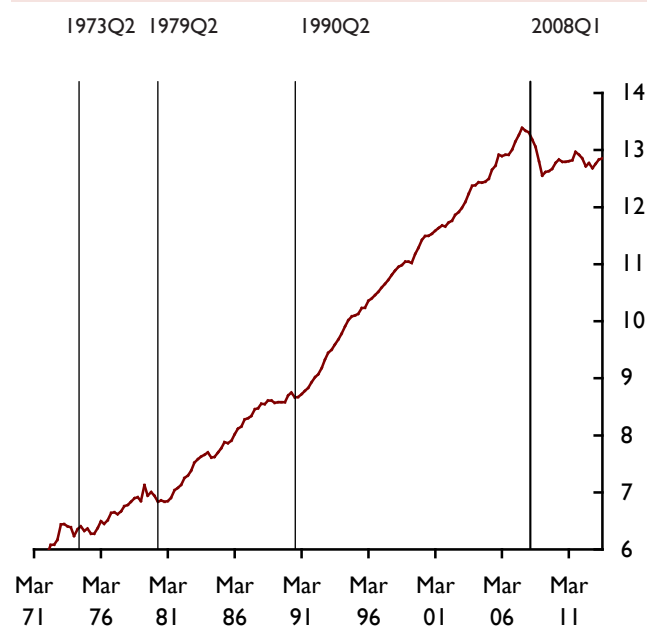
Our main focus is on the slowdown in growth of aggregate labour productivity. Labour productivity is estimated to have fallen sharply during the recession of 2008–9, and to have recovered only sluggishly after that. Figure 1 shows the unusually slow recovery of output per worker following the most recent recession when compared with the three other major UK recessions since the beginning of the 1970s. Cross-country evidence suggests that the productivity slowdown has been more pronounced in the United Kingdom than in other countries (Office for National Statistics, 2014).

Understanding the continued weakness of productivity relative to pre-crisis trends and the scope to make up past losses is of key importance to macroeconomic policy. Now that the economy is beginning to recover, a key question is whether any of the lost productivity growth of recent years will be made up.

Any explanation for the recent weakness of productivity growth needs to start from the observation that the macroeconomic position of the UK economy, like most advanced economies during the Great Moderation period, was broadly balanced with growth of around trend, inflation at target and with output close to potential. This was in contrast to the macroeconomic position leading up to all other postwar downturns when there had been a prior imbalance between aggregate supply and demand and the recession was caused by the policy tightening needed to bring inflation under control. On this occasion, monetary policy was loosened to offset the impact of

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Figure 1. Constant price GDP per worker (£ 000s, per quarter)



Source: Office for National Statistics.

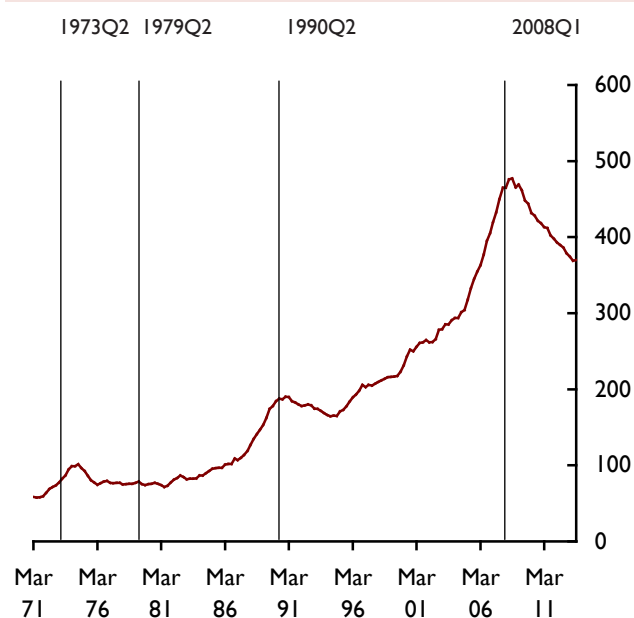
Note: GDP per head is GDP (chained volume measure; ABMI) divided by LFS measure of 16+ employment (MGRZ).

a sharp contraction in global demand, together with the consequences of tight credit conditions and greater uncertainty on demand at home. Low interest rates, together with a lower exchange rate, provided breathing space to incumbent businesses and allowed them to absorb the demand shock. That in itself might have accounted for weaker productivity in some businesses. But low interest rates would typically encourage businesses to increase their capital intensity and boost productivity. So it is unlikely that low interest rates alone could account for the weakness in aggregate productivity.

Against that background it is possible to distinguish two broad explanations for the weakness of UK labour productivity following the financial crisis.

The first broad explanation emphasises the impairment of the banking sector and the effect of tight credit conditions on the supply side of the economy.<sup>1</sup> Figure 2 shows that bank lending to companies fell more sharply in the aftermath of the most recent recession than it did in the three other post-1970 recessions. According to this view, a lack of credit availability stunted the development of high-productivity, mainly young and small bank-dependent firms. The absence of competitive pressure from such companies, together with low interest rates

Figure 2. Real stock of PNFC bank debt outstanding (£ billion)



Source: Bank of England and ONS.

Note: Stock of M4 lending to PNFCs adjusted for write-offs deflated by GDP market price deflator (2010=1; YBHA/ABMI).

and bank forbearance, then provided protection for older established companies. Their continued survival led to congested markets and reduced the profit opportunities available to more dynamic businesses with the result that the normal reallocation of capital towards stronger businesses did not happen and aggregate productivity stagnated. According to this explanation, productivity would pick up and wages grow without generating additional inflationary pressure once the banking sector was repaired. Simply stimulating demand without repairing the banking sector would be inflationary because the stagnation of productivity reflected a weakness on the supply side of the economy.

The second broad explanation for the weakness of UK productivity emphasises labour market flexibility and the willingness of workers to accept nominal pay freezes in some instances and real wage reductions more generally in order to keep their jobs in a weak demand environment.<sup>2</sup> The relative weakness of wages would also have encouraged generalised labour hoarding whereby businesses held on to employees to avoid firing costs and kept them occupied looking for new business and servicing existing customers. But this explanation goes beyond traditional cyclical labour hoarding in that it may also account for why businesses replaced workers

who quit and maintained employment levels even when output remained weak. According to this explanation, productivity would pick up and wages grow without generating additional inflationary pressure if demand could be stimulated.

In principle, these hypotheses can be distinguished by their empirical predictions, especially by examination of disaggregated data. If the productivity slowdown were caused by lack of access to credit it would be associated with heterogeneous changes in productivity across different types of companies and sectors according to their reliance on the banking sector. According to this view, bank-dependent companies would grow more slowly than otherwise or not get started at all, while other companies might survive longer than they otherwise would. By contrast, the productivity slowdown would be more widespread according to the second broad explanation.

In practice, it is likely that both of these explanations have been at work to some extent over the course of the recession and the subsequent weak recovery. The aim of this paper is to assess the evidence for and against the banking sector impairment explanation of the weakness in labour productivity. To preview our findings, we find clear evidence that the banking sector crisis affected credit supply to businesses and caused bank lending to decline. This is a necessary condition for the banking sector impairment explanation of the labour productivity slowdown. But we do not find clear evidence of the heterogeneity in performance between different businesses and industrial structures that would have been expected if banking sector impairment had been the key factor holding back productivity growth. This suggests either that banking sector impairment is acting on businesses in ways that are not well understood or (and) that other factors have also been important.

Section 2 describes the evidence that the banking sector crisis affected the financing conditions facing UK businesses – a necessary condition for this explanation of the productivity slowdown. Section 3 assesses the evidence for whether the slowdown in productivity in different sectors matches their dependence on banks. Section 4 assesses the evidence at the level of individual businesses. Section 5 concludes.

## 2. Evidence of banking sector impairment on supply of finance to companies

The global financial crisis that began in the summer of 2007 had a profound effect on banks and the provision of finance to businesses in the United Kingdom. The

crisis revealed that the banking sector as a whole was undercapitalised and led to the exit of some institutions, the rescue of others and widespread injections of public and private capital. One indicator of the intensity of the crisis is the cost of insuring the unsecured debt of banks against the risk of default as given by Credit Default Swap (CDS) premiums. Figure 3 shows the sharp rise, prolonged elevation and recent fall in the CDS premiums of the major UK banks.

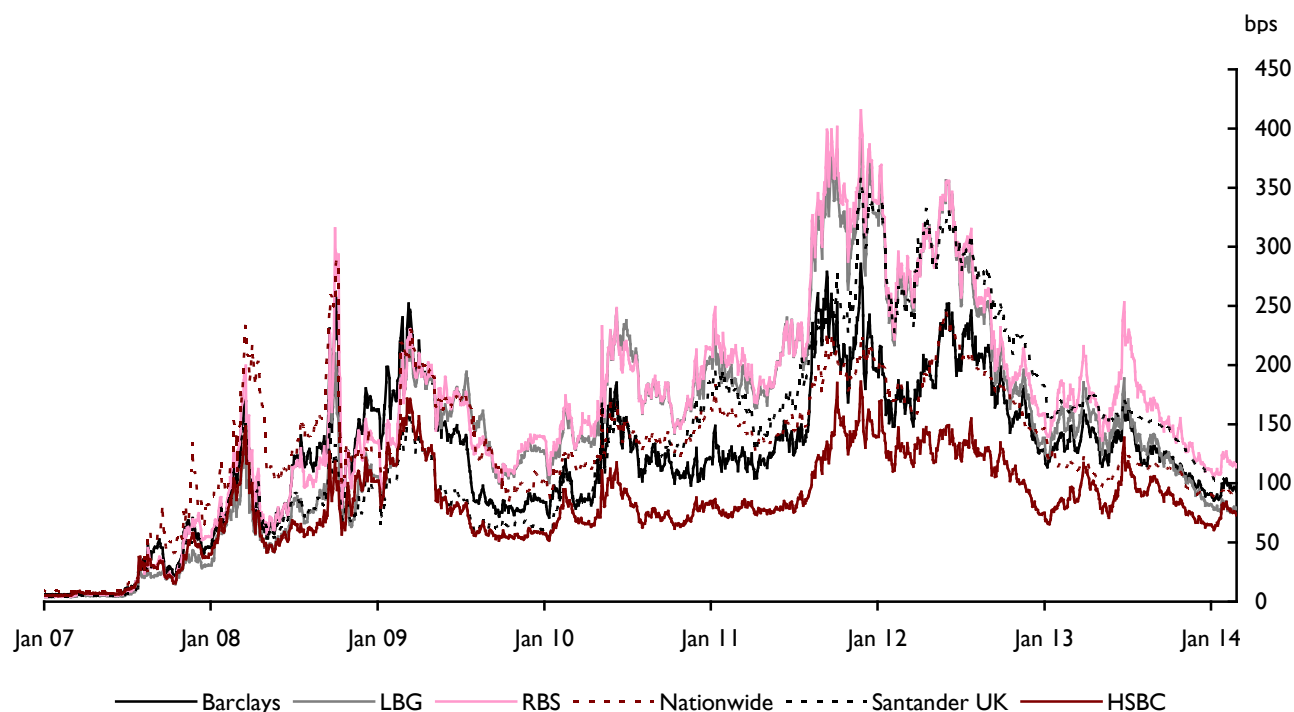
Prior to the crisis, the CDS premiums of the major UK banks had been close to zero, consistent with bank default being considered a very low probability event by market participants. The prospect of default meant that the cost that banks had to pay to fund themselves in wholesale markets rose sharply for all banks, albeit by differing amounts, with especially severe consequences for those banks that were reliant on wholesale funding.

The higher cost of bank funding relative to interest rates on completely safe assets such as government bonds could be expected to have a number of consequences for the banks and their business customers. In particular, it was likely to lead to a tightening of credit conditions. Consistent with this, Gilchrist and Zakrajsek (2011), in an investigation of credit conditions in the United States, found that CDS premiums on bank debt are highly correlated with their preferred indicator of credit conditions.

There are a number of channels by which unexpectedly higher bank funding costs would be likely to impact on the business customers of the banks. First, new loans would become more expensive as banks passed on the higher cost of market funding. Second, while companies with existing agreed loan facilities would be insulated from the effect of the higher bank funding costs, they would nevertheless expect to pay higher spreads on loans once those facilities expired. Third, to the extent that banks were lending on pre-arranged loans at below their now higher cost of funding, they would have an incentive to withdraw existing facilities if that were contractually possible, and reprice them.

In addition to the effects of higher bank funding costs, it is likely that bank credit supply became more restricted due to lower risk appetite and reduced competitive pressure caused by the exit or change in business model of some lenders. These factors may have led to costlier terms and more stringent conditions on new bank loans than would be justified by higher bank funding costs alone. They may also have led to the withdrawal of banks from riskier forms of lending.

Figure 3. Indicators of bank funding costs (basis points)



Source: Thomson Reuters Datastream.

Note: Five-year senior credit default swap premiums.

One manifestation of the sharp tightening of credit supply conditions was the fall in the stock of loans to businesses shown earlier in figure 2. While this was also likely to have reflected some weakening of credit demand, Bell and Young (2010) found that tight credit supply was likely to have been the dominant influence in the three years immediately following the start of the crisis in summer 2007. HM Treasury (2013) also examined this issue in their more recent assessment of the effect of credit conditions on the economy in the context of the RBS bad bank review.

These studies of credit supply conditions draw on a number of different sources: indicators of the price of bank credit; surveys of lenders; surveys of businesses; and evidence from non-bank sources of finance.

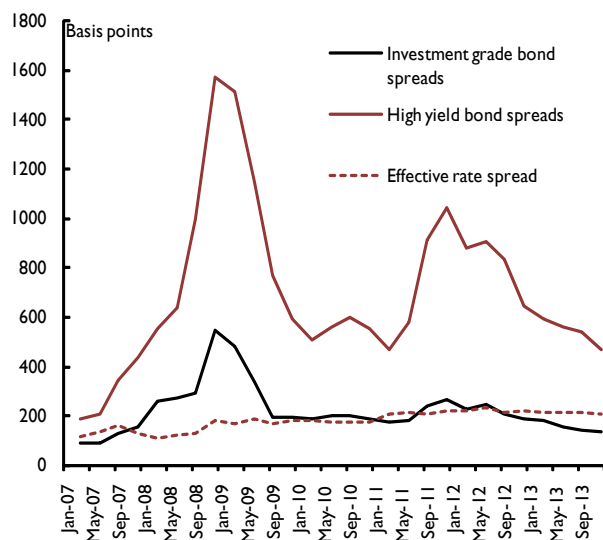
### *The price of bank credit*

Measuring the impact of tighter credit supply on the cost of bank finance to businesses is not straightforward. In particular, there are no comprehensive data on quoted interest rates on new loans to businesses split by credit

quality. While there are good quality data on the average lending rates actually paid by businesses, it is likely that these rates understate the cost of new credit to the average business when banks are focusing their lending mainly on collateralised lending to good quality customers. Moreover, there is no clear distinction in the available data between interest rates paid on new and existing loans; for some lenders, new business includes companies drawing down existing facilities with pre-arranged costs, or loans that have been repriced in line with changes in reference rates. Reflecting both of these factors, and given that existing facilities are likely to have had lower spreads than those on genuinely new credit since the start of the crisis, measured effective rates are likely to have underestimated the rates at which companies have been able to arrange genuinely new loans from banks in practice.

Figure 4 shows measures of the spread on different forms of business debt finance. While the measured effective new lending spread may be a good indicator of the cost of borrowing from banks for good quality businesses drawing on existing facilities, the cost of genuinely new

Figure 4. Indicators of corporate borrowing costs



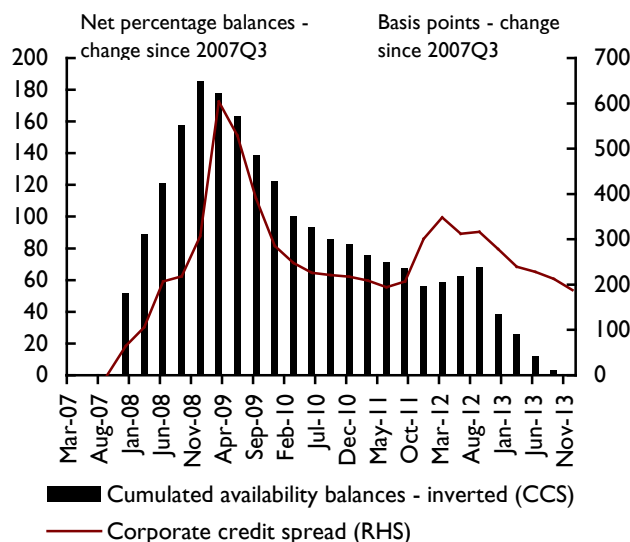
Source: Bank of England and Reuters Datastream.  
 Note: Effective rate spread is average interest rate on new bank loans to PNFCs less Bank Rate.

borrowing is likely to have been better measured by the other spreads according to the risk of the business. This would indicate that the cost of new borrowing relative to Bank Rate peaked in around early 2009 and has since declined, albeit with a further rise in 2011 and 2012 in response to the effects of the Euro Area crisis on UK banks.

**Surveys of lenders**

Evidence from the lenders suggests that price and non-price terms on loans rose during the financial crisis. Lenders responding to the Bank of England’s *Credit Conditions Survey* reported that spreads increased markedly across all types of lending, particularly during 2008 and early 2009. The net percentage balances of lenders reporting increased fees and commissions on loans to companies also rose. According to the *Credit Conditions Survey*, the availability of lending to businesses contracted markedly during 2007 and 2008, and has gradually improved since then. Figure 5 plots the cumulated net percentage balance from the *Credit Conditions Survey* alongside the Bank of England’s indicator of corporate credit spreads (*Inflation Report*, February 2014, p. 14). These separate indicators broadly move together and suggest that bank credit supply conditions were at their most adverse for businesses in early 2009, and have since improved.

Figure 5. Corporate credit conditions



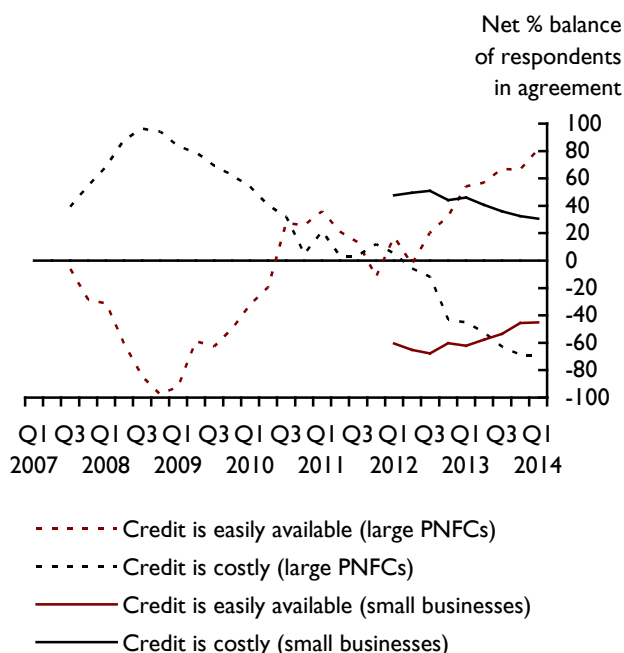
Source: Bank of England calculations (*Inflation Report*, February 2014, p. 14) and *Credit Conditions Survey*.

An independent review led by Sir Andrew Large into the lending practices of RBS, the lender with the largest share of the SME market, found widespread failure when it reported in November 2013. It concluded that ‘for some time RBS has not succeeded in supporting the SME sector in a way that meets either its own financial targets, or the expectations of customers and external stakeholders’.

**Surveys of businesses**

Surveys of businesses point to divergent trends in credit conditions for large businesses, especially those with access to the debt capital markets, and smaller businesses that are reliant on banks for external finance. Respondents to the *Deloitte Chief Financial Officer* surveys, mainly large businesses with capital market access, indicated that bank credit became increasingly unattractive during 2007–8, but have become progressively more attractive since then. This evidence suggests that the credit crisis had effectively ended by around 2011 for those types of companies. But this does not appear to be the case for smaller businesses. Figure 6 shows responses to the *Deloitte CFO* survey on the cost and availability of finance and compares these with the responses of smaller businesses when the same questions were added to the Federation of Small Business (FSB) quarterly survey. Smaller businesses continue to report that credit is costly and not easily available.

Figure 6. Survey evidence on the cost and availability of finance to business

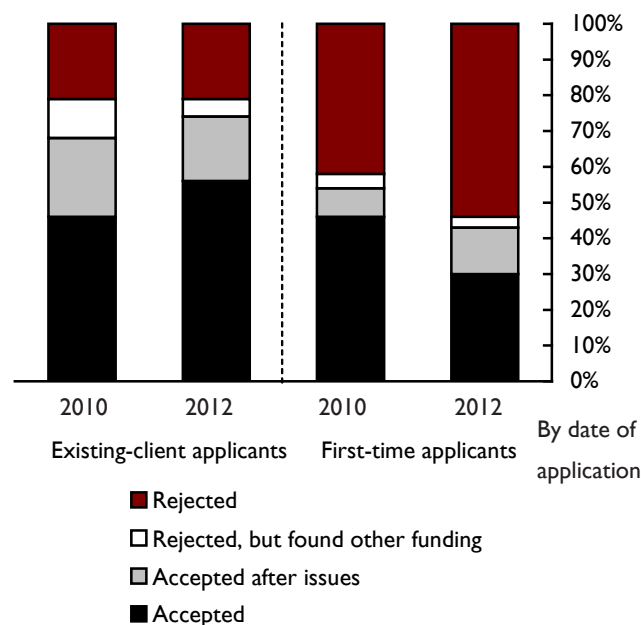


Source: Deloitte CFO Survey and Federation of Small Business Survey.

Even within the population of smaller businesses, there is substantial variation in the extent to which businesses want to access external finance and the conditions they face. The SME Finance Monitor, the most comprehensive source of information on the financial conditions facing SMEs, classifies a substantial proportion of SMEs, as ‘happy non-seekers’, businesses not looking to increase their borrowing facilities. In the September 2013 wave of the survey 78 per cent of SMEs were ‘happy non-seekers’ of finance, based on their behaviour in the twelve months prior to interview. These SMEs had neither sought new or renewed loan or overdraft facilities in the twelve months prior to interview, nor felt that anything had stopped them from applying. Around 40 per cent of SMEs were classified as permanent non-seekers. Seven per cent of SMEs were classified as ‘would-be seekers’ of finance from banks, but were reluctant to apply for fear of being rejected or because the process was felt to be burdensome.

But the SME Finance Monitor also points to the difficulty that businesses who would like external finance have faced in arranging new finance. Figure 7 shows that applications for loans and overdrafts from businesses with an existing banking relationship were more likely

Figure 7. Outcome of loan applications



Source: SME Finance Monitor.

to be successful. In 2012, over half of applications from first-time applicants were rejected. This suggests that new businesses would find it difficult to raise finance in this environment. In addition existing businesses would have difficulty in switching to a different lender.

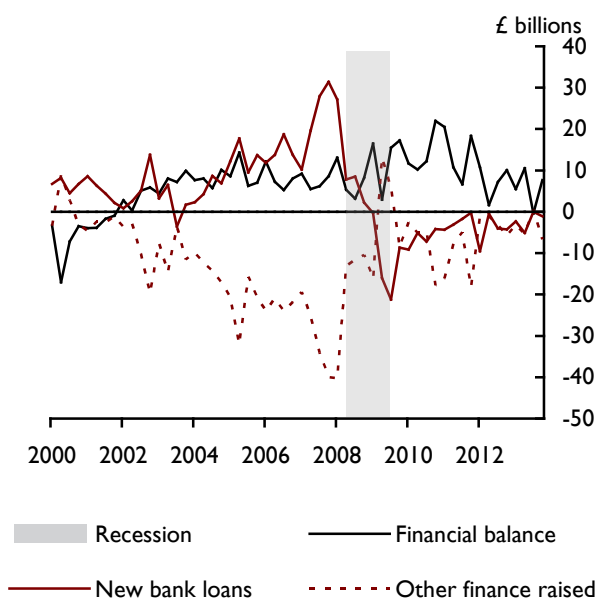
In a detailed investigation of the SME Finance Monitor, Armstrong *et al.* (2013), found that rejection rates for both overdrafts and term loans were significantly higher in the period from 2008–9 onwards, even controlling for risk factors, which is indicative of constraints to the supply of credit.

It is possible though that some incumbent companies have faced easier credit conditions than is warranted by their financial condition. According to the ‘zombie’ hypothesis of Caballero *et al.* (2008), banks may have shown forbearance towards businesses to avoid crystallising losses that would appear on their own balance sheets. But a recent Bank of England analysis (Arrowsmith *et al.*, 2013) found that outside the commercial real estate (CRE) sector only around 6 per cent of companies, amounting to 14 per cent of bank exposure to non-CRE SMEs, were benefitting from bank forbearance in 2013.

### Non-bank sources of finance

One of the features of aggregate company finances since the financial crisis has been the shift away from bank financing to other sources. The decline in bank lending to companies since early 2008 has been associated with

Figure 8. UK PNFC's financial balance and new external finance



Source: Bank of England and ONS.  
 Notes: PNFC financial balance (RQBV), new sterling and foreign currency loans to PNFCs from UK monetary and financial institutions, other finance is calculated by residual.

less negative flows of other types of finance alongside a rise in financial saving. While net external finance raised has been weak, the change in the contribution from bank loans as a source of finance since the crisis has been remarkable (figure 8). Some large companies have been able to access the debt capital markets at cheaper rates than the banks, providing a clear incentive to disintermediation. In a recent study using company-level data, Farrant *et al.* (2013) found that much of the finance raised was used to restructure the balance sheets of the few, very large, companies able to access the debt capital markets.

### Summary of evidence on finance for business

Evidence on the impact of the banking crisis on credit conditions facing businesses is summarised in table 1. It emphasises that there is substantial heterogeneity in the extent to which different businesses are likely to have been affected by the banking sector crisis. The banking crisis is likely to have had the most adverse effect on new businesses with little existing collateral, businesses seeking to expand quickly and businesses with stretched balance sheets. But some, mainly mature businesses are likely to have experienced better credit conditions.

### 3. The effect of bank credit conditions on the performance of UK companies: sectoral analysis

One means of identifying the impact of the banking sector crisis on productivity is through an empirical analysis of productivity trends in different industrial sectors. If the banking crisis has been important in affecting

Table 1. Summary of evidence on business financial conditions

Type of business	Evidence
Potential new entrants	<ul style="list-style-type: none"> <li>High rejection rates for loan applications by first-time applicants</li> </ul>
Financially immature incumbents	<ul style="list-style-type: none"> <li>Higher spreads on new loans and overdrafts</li> <li>Lower rates on existing facilities as lower Bank Rate is passed through</li> <li>Reduced credit availability for some and pressure to repay existing facilities</li> <li>Higher rejection rates for loan applications than before the crisis</li> <li>Perceived need to adjust balance sheets to tighter credit supply conditions before existing facilities are renewed</li> </ul>
Financially mature incumbents	<ul style="list-style-type: none"> <li>No financial pressure</li> <li>Lower interest rates on existing facilities</li> <li>Use of debt capital markets to repay bank debt</li> </ul>
Poorly performing incumbents	<ul style="list-style-type: none"> <li>Little evidence of bank forbearance, although some businesses were supported by their lenders</li> </ul>

productivity, then it might be expected that productivity would have deteriorated by more in the most bank dependent sectors. The aim of this section is to assess the evidence for whether the slowdown in productivity in different sectors matches their dependence on banks prior to the crisis and their vulnerability to a tightening of credit conditions.

### Bank dependence

In order to assess this issue, we first bring together evidence on the bank-dependence of different industrial sectors in the United Kingdom. We focus on the main private sector industries, but we exclude those where productivity is likely to be affected by sector-specific issues, such as agriculture, extraction and finance. Table 2 provides a judgement-based ranking of one-digit industrial sectors according to their bank dependence, with the most bank-dependent sectors at the top of the table. The ranking is based on a number of different measures of each sector's reliance on bank finance.

The ranking aims to classify industries according to the extent to which businesses are vulnerable to a sudden shift in banking sector credit conditions. In principle,

a good measure of this would be the proportion of industry output that is supplied by businesses who rely on banks to provide the marginal source of finance. But, in practice, such a measure cannot easily be calculated from existing data and so has to be approximated by other measures.

The most common measure in the academic literature of the external finance dependence of an industry is based on the proportion of capital expenditures financed by external funds in an average firm, as originally suggested by Rajan and Zingales (1998). This is intended as an inherent, structural, time-invariant measure of the dependence of an industry on external finance, reflecting technological factors such as the initial scale of projects and their gestation periods. While this measure is widely used in cross-country studies, it has certain deficiencies (see, for example, von Furstenberg and von Kalkreuth, 2006). First, focusing on gross borrowing flows over a particular period may misrepresent the exposure of an industry to banking shocks if that borrowing is repaid quickly. For this reason it is better to focus on debt stocks. Second, focusing on financing flows as a share of investment will overstate the importance of external

Table 2. Industries ranked by bank dependence

	Gross loans to output		Gross loans net of deposits to output		Gross loans to capital	Pre-crisis lending growth	Share of assets due to SMES with bank finance
	2008Q1	2013Q3	2008Q1	2013Q3	Pre-crisis	2005–7	
Accommodation and food	0.84	0.60	0.71	0.45	0.45	63	0.39
Construction <sup>(a)</sup>	0.72	0.49	0.44	0.24	0.11	91	0.49
Wholesale and retail	0.41	0.27	0.18	0.03	0.29	63	0.40
Manufacturing	0.44	0.24	0.17	-0.08	0.25	24	0.22
Transport and storage	0.32	0.24	0.17	0.02	0.14	-8	0.28
Arts and entertainment	0.71	0.29	-0.12	-0.25	0.25	67	0.35
Administration and support	0.41	0.26	-0.15	-0.19	0.15	101	0.35
Professional and scientific	0.38	0.16	-0.27	-0.43	0.96	106	0.09
Information and communication	0.11	0.13	0.01	-0.16	0.11	-8	0.27
<i>Main sectors</i>	<i>0.39</i>	<i>0.24</i>	<i>0.09</i>	<i>-0.09</i>	<i>0.18</i>	<i>50</i>	<i>0.28</i>

Source: Bank of England and ONS.

Notes: All currency loans and deposits from Bank of England industrial analysis (tables C1.1 and C1.2 in Bankstats). Output is value of sectoral output in previous four quarters. Pre-crisis lending growth is calculated from 2003Q1 to 2008Q1. Final column based on Companies Accounts data. SMEs defined as companies with total assets of less than £11.4 million, in line with Companies House thresholds.



finance in industries that are not very capital intensive. For this reason it is better to focus on a measure of the stock of loans outstanding as a share of output. Such a measure shows the bank liabilities of an industry relative to the output that generates the means to service those loans.

The first column of figures in table 2 shows this measure of bank-finance dependence – the stock of gross loans outstanding relative to the value of the output of the industry – for each industry prior to the crisis. According to this measure, the accommodation and food sector, consisting of hotels, pubs and restaurants, was the most bank-dependent industrial sector at the start of the crisis; the information and communication services sector was the least bank-dependent. This measure fell sharply in the years following the crisis in all industries, except information and communication services, consistent with a widespread credit crunch.

There are some potential disadvantages with this measure that other measures shown in the table might rectify. One disadvantage is that it takes no account of the bank deposits that businesses in the same industry might also hold. So an alternative measure uses in the numerator gross loans net of deposits placed by businesses in the same sector. This is shown in the third column of figures in table 2. This shows that there are certain industries with high levels of debt before the crisis, such as arts and entertainment, that had even higher levels of bank deposits. Such industries should be better placed to withstand a credit crunch since, in aggregate, businesses in that industry have sufficient cash balances to draw on if debt becomes more costly or difficult to access. Against this, it is also likely that the debt and deposits are distributed unevenly, and possible that the businesses with high levels of net debt are more capable of faster growth than the businesses with net deposits that may be immune to the effect of tighter credit conditions.

Another potential disadvantage with the gross debt to output measure of bank dependence is that businesses with high debt levels secured against property might not need credit to carry out normal operations to the same extent as businesses that need to roll over bank debt on a regular basis to fund working capital needs. An alternative measure is the cumulative growth in the stock of loans in the five years leading up to the financial crisis. This is shown in the sixth column of figures in table 2. This measure shows certain industries expanded their bank borrowing particularly rapidly in the run-up to the financial crisis and so might be more vulnerable to

a sudden stop in credit growth. These industries included some of the business-facing service sectors – especially administration and support services and professional and scientific services – that had low levels of gross debt and negative debt net of deposits. The construction industry also had strong growth in gross debt prior to the crisis.

A stock equivalent of the Rajan-Zingales measure is the ratio of bank debt outstanding in an industry relative to the capital stock, shown in the fifth column of table 2. This is relatively high in the accommodation and food industry, consistent with other measures of bank dependence. But it is highest in professional and scientific services, which otherwise does not stand out as being bank dependent. But this is probably a misleading indicator in this case as while debt is high in relation to capital, capital itself is relatively unimportant in production in that industry.

A further measure of bank-dependence is the proportion of total assets due to small and medium-sized companies in each industry identified as having bank debt. This measure is derived from company-level data. This measure also points to vulnerability in the construction, accommodation and food, and wholesale and retail service sectors.

Overall, there is some ambiguity about the ranking of different industries according to their bank dependence. Some industries score highly on some measures but not others. What does appear clear though is that construction is one of the more bank-dependent sectors, while information and communication is not.

### *Simple framework*

In order to frame the discussion of how bank dependence might affect the productivity of an industry, we sketch out a simple framework. Using a simple Cobb-Douglas production function, labour productivity in a sector is given by:

$$\frac{Y}{N} = A(1 + \lambda)^{1-\alpha} \left( \frac{K}{N} \right)^\alpha \quad (1)$$

where  $Y$  is output,  $N$  is employment,  $\lambda$  is a measure of total factor productivity (which changes over time at the rate of labour augmenting technical progress),  $K$  is the capital stock,  $\alpha$  is the capital share and  $A$  is a constant. By this expression, productivity growth in the long run derives from technological improvements that are usually taken to be exogenous, perhaps due to organisational change or by taking on or training

better-skilled employees (reflected in  $\lambda$ ), and endogenous increases in the capital–labour ratio (capital-deepening) in response to changes in relative factor prices. In the short run, productivity may also change due to changes in the rate of utilisation of factors.

According to this framework, banking sector impairment would affect productivity by making it more difficult or expensive to finance capital spending and cause affected businesses to choose a less capital-intensive mode of production. If all businesses were the same and the amount of labour available were fixed then this would reduce the overall level of output that the economy could supply. The decline in aggregate output would be a reaction to a lower capital stock brought about by more expensive bank credit.

In an economy made up of different sectors and businesses with varying needs for bank credit, persistent banking sector impairment would lead to a shift in the share of output away from the more bank-dependent sectors and businesses. Its effect would also depend on how wages and the cost of capital responded to lower output. For example, if the labour market was very flexible and wages fell relative to the cost of capital in the whole economy, then labour productivity would fall even in sectors that were not bank dependent as labour was substituted for capital in response to the change in relative factor prices. In this case, the decline in aggregate output would be a reaction to a lower capital stock and to it not being allocated efficiently.

This can be formalised since, using (1), productivity growth – the change in log productivity – between any two dates is given by:

$$\begin{aligned} \Delta \ln y_T &= \ln \left( \frac{Y}{N} \right)_T - \ln \left( \frac{Y}{N} \right)_{T-1} \\ &= (1 - \alpha)(\lambda_T - \lambda_{T-1}) \\ &\quad + \alpha \left( \ln \left( \frac{K}{N} \right)_T - \ln \left( \frac{K}{N} \right)_{T-1} \right) \end{aligned} \quad (2)$$

If it could be assumed that the rate of growth of total factor productivity was constant over time in each sector and the only shock to the optimal capital–labour ratio was due to the banking crisis, then this would imply that sectoral productivity growth could be written as:

$$\Delta \ln y_{iT} = \Delta \ln y_{iT-1} - \theta_i B_T \quad (3)$$

where  $\theta_i B_T$  represents the bank dependence of each industry and the size of the aggregate banking sector

shock. In other words, under these assumptions, productivity growth would be equal to what it was in the previous period less an amount that would vary across industries according to their bank dependence.

So, using this simple framework, and the evidence on bank dependence, the effect of banking sector impairment would be to reduce productivity relative to what it would otherwise have been in all sectors to some extent, but the largest declines relative to the counterfactual would be in construction, manufacturing and the consumer-facing service sectors (accommodation and food, wholesale and retail), whereas the smallest falls would be in the business-facing services sectors such as information and communication services.

### *Productivity and bank dependence*

Table 3 summarises productivity performance in the one-digit industries ranked according to their bank dependence, with the most bank-dependent sectors at the top of the table.

On average, labour productivity in these industries had grown by 14 per cent in the five years leading up to the crisis, an annual rate of around 3 per cent. It then fell sharply during the recession, recovered a little and then stagnated. The swing in productivity – the turnaround in the five-year growth rate – amounted to –19 per cent, similar in aggregate to the deviation of productivity from the continuation of a pre-crisis linear trend. The deterioration in productivity performance appears to have been fairly widespread. The smallest decline appears to have been in construction, where productivity growth was negative in the run-up to the crisis. The largest declines were in the manufacturing, transport and storage, and information and communication industries, where productivity growth was strongest in the run-up to the crisis.

There does not appear to be any clear relationship between either the turnaround in productivity growth or the gap between productivity and a linear pre-crisis trend and the bank dependence of a sector. That is, there is no evidence to support the relationship highlighted in equation (3). On the face of it, this is evidence against the banking sector shock being the primary cause of the weakness in productivity.

This assessment is based on a very simple counterfactual – that in the absence of the banking sector crisis productivity growth would have continued at the same rate as in the previous period. But it is possible that the assumptions used to derive equation (3) may not hold in

Table 3. Labour productivity in industries ranked by bank dependence

	Productivity growth in five years before and after 2008Q1			Estimated productivity shortfall at 2013Q3 (minus is a shortfall)			Output shortfall 2013Q3
	Pre-crisis	Post-crisis	Swing	Relative to linear trend	Relative to output-adjusted trend	Relative to output and capital- adjusted trend	
Accommodation and food	12	-7	-19	-11	-5	+2	-4
Construction	-3	-2	+1	-7	+1	-4	-11
Wholesale and retail	13	1	-12	-12	-4	-14	-2
Manufacturing	26	0	-26	-23	-21	-5	-9
Transport and storage	7	-22	-29	-23	+16	-8	-17
Arts and entertainment	10	-5	-15	-12	-7	+13	-5
Administration and support	16	4	-12	3	+6	+7	+13
Professional and scientific	26	-11	-37	-18	+1	-11	+3
Information and communication	29	1	-28	-24	-24	-6	+8
<i>Main sectors</i>	<i>14</i>	<i>-6</i>	<i>-19</i>	<i>-15</i>	<i>-4</i>	<i>-5</i>	<i>-3</i>

Source: ONS and own calculations.

practice. In particular it is likely that output and capital investment in many of these sectors would have changed by differential amounts in the absence of a banking sector crisis, especially as global economic conditions had deteriorated. Any such changes would have altered the path of labour productivity in the various industrial sectors and so affected our assessment of the impact of the crisis. In order to quantify the possible importance of this, we use pre-crisis relationships to adjust for different post-crisis trends in output and capital growth in two ways.

First, productivity is naturally affected by cyclical influences. Productivity typically falls relative to trend in a cyclical downturn as employment is slow to adjust to the weakness of demand and output. This would suggest that some of the slowdown in productivity growth is likely to have been caused by the weakness of demand. Indeed, Ashworth, Goodhart *et al.* (2013) claim that the productivity slowdown is a largely cyclical response to persistent weak demand.

To assess this, the productivity shortfall can be cyclically adjusted by estimating what level of productivity would have been expected in each industry given the

normal relationship between employment and output. The outcome is shown in the fifth column of figures in table 3. As can be seen, this adjustment does reduce the size of the estimated aggregate productivity shortfall considerably, although it does not eliminate it. In fact, as is illustrated later for two industries in figures 9 and 10, it explains most of the productivity decline in the immediate aftermath of the recession. But it does not explain the subsequent continued weakness; labour hoarding as demand weakens can only be expected to last for a limited time. It is also more significant in some industries than others, reflecting their different rates of output growth since the crisis. For example, the largest gap between output five years after the start of the crisis and its pre-crisis level is in the transport and storage industry (seventh column of figures in table 3). Once allowance is made for the sharp decline in output experienced in that industry, productivity is estimated to be 16 per cent higher than the pre-crisis relationship would suggest. That is, given the fall in output, it is surprising that productivity there did not fall by even more.

Second, as is emphasised by equation (1), labour productivity is also affected by the extent of capital

deepening in each industry. Indeed this is the main channel by which the banking crisis is expected to affect labour productivity. Consistent with this, the fast upward pre-crisis trend in labour productivity in some industries was associated with rapid investment and fast capital stock growth rather than fast growth in total factor productivity (TFP). In deriving equation (3) it was assumed that the pre-crisis capital deepening trends would have continued if it were not for the banking crisis. But this may not be the case. It is possible that investment and capital growth in some fast growing industries was only temporarily strong and was about to slow independently of the banking sector crisis. Moreover, the increase in uncertainty in the post-crisis period was likely to have caused businesses to postpone capital investment even if those businesses were not reliant on the banking system to finance it. And it is notable that in many industries – construction, wholesale and retail, manufacturing, information and communication – labour productivity growth simply stopped in the post-crisis period, irrespective of its pre-crisis trend. This could have been associated with a sudden stop in capital stock growth as investment fell sharply for reasons independent of the banking crisis. So it is possible that the slowdown in productivity growth in industries not directly affected by the banking crisis – information and communication, for example – could be accounted for by an independent reduction in investment.

A significant difficulty in assessing this is that capital stock estimates have been especially unreliable in recent years and the ONS has stopped updating them beyond 2010. In what follows, we use ONS estimates of the net capital stock at constant prices until 2010. Beyond that, we assume that the capital stock in each sector grows at the same rate as in the previous two years. Pessoa and van Reenen (2013) calculate TFP on the basis of different assumptions about capital stock growth and find a relatively small fall in TFP after the crisis that they attribute to under-utilisation of factors in the recession and uncertainty-driven misallocation. But Oulton (2013) argue that the estimate of capital per worker used by Pessoa and van Reenen is incorrect as it is based on too high an estimate of the pre-crisis capital stock. Clearly, the lack of reliable data on capital at the sectoral and aggregate level makes it difficult to be confident in the conclusions of this analysis.

Based on the available capital stock data, we estimate what level of productivity would be expected in each industry given the normal relationship between employment, output and capital stock growth. To do this we embed equation (1) in an employment equation

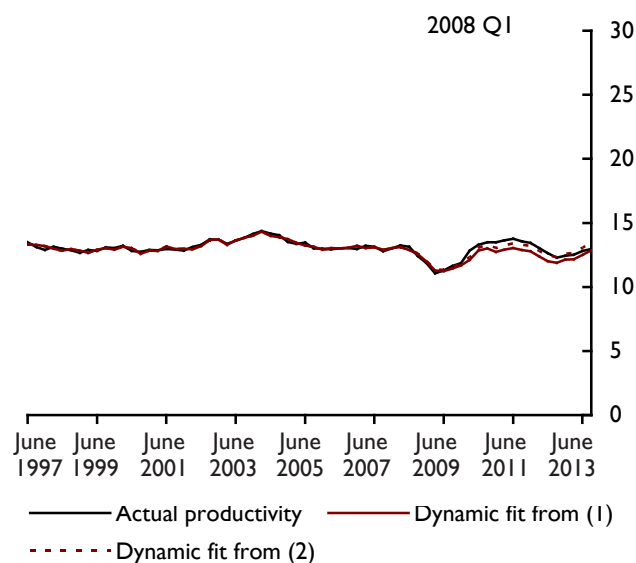
written in error correction form which is estimated for each sector:

$$\Delta \ln N_t = \text{const} + \phi_1 \Delta \ln Y_t - \phi_2 \left( \ln N_{t-1} - \frac{1}{(1-\alpha)} (\ln Y_{t-1} - \alpha \ln K_{t-1}) + \lambda_{t-1} \right) \quad (4)$$

We then simulate what productivity would have been in each industry if the pre-crisis relationship between employment, output and capital had continued to hold. The outcome is shown in the sixth column of table 3. It shows that in some industries there is no longer a significant abnormal weakness in productivity once account is taken of the normal pace of adjustment of employment to movements in output and the capital stock, implying that in these industries TFP is not unusually weak.

Figures 9 and 10 show the level of productivity relative to the implied trend in a clearly bank-dependent industry (construction) and one that is clearly not bank dependent (information and communication). The figures suggest that much of the weakness of labour productivity in those industries can be explained once the weakness of both output growth and capital investment are taken

Figure 9. Productivity in construction (actual and dynamic fitted values)



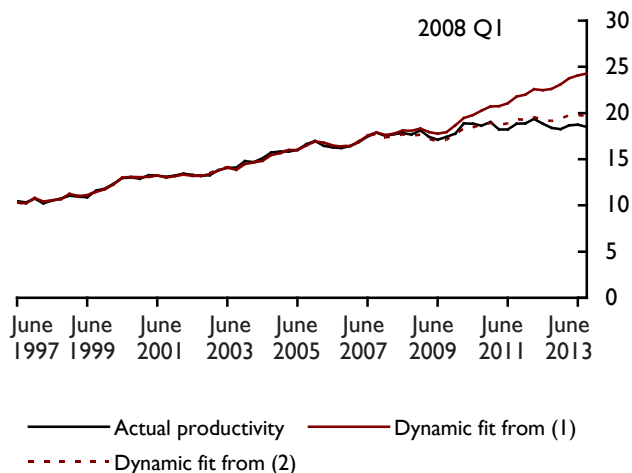
Source: Office for National Statistics.

Notes: Sectoral output divided by sectoral employment (£000 per quarter in constant prices). Dynamic fitted values use:

(1)  $\Delta \ln E = -0.283 + 0.1 \Delta \ln Y - 0.00004 \text{Trend} - 0.11 (\ln E - \ln Y)_{-1}$

(2)  $\Delta \ln E = -0.06 + 0.1 \Delta \ln Y - 0.0003 \text{Trend} - 0.07 (\ln E - 1.5 (\ln Y - 0.33 \ln K))_{-1}$

Figure 10. Productivity in information and communication (actual and dynamic fitted values)



Source: Office for National Statistics.

Notes: Sectoral output divided by sectoral employment (£000 per quarter in constant prices). Dynamic fitted values use:

$$(1) \Delta \ln E = -0.11 + 0.15 \Delta \ln y - 0.0011 \text{Trend} - 0.05 (\ln E - \ln Y)_{-1}$$

$$(2) \Delta \ln E = -0.21 + 0.18 \Delta \ln y - 0.00008 \text{Trend} - 0.09 (\ln E - 1.5 (\ln Y - 0.33 \ln K))_{-1}$$

into account. In other words, labour productivity in those industries is not abnormally weak conditional on the behaviour of output and measured capital accumulation. That suggests that there was little change in total factor productivity in those industries following the banking crisis.

One of the striking features of table 3 is that there *does* appear to be a correlation between the size of the output shortfall relative to its pre-crisis peak and the bank dependence of the industries.<sup>3</sup> Output is generally below its previous peak in the more bank-dependent sectors and above it in the largely business-related service sectors that are less reliant on the banking sector. In other words, bank dependence may explain why output growth has remained weak in some sectors of the economy. And, given that all sectors are reliant to some extent on the banking sector, it suggests that at least some of the weakness in output in all industries might be due to the impairment of the banking sector. Further, even in the largely bank-independent information and communication sector, for example, the slowdown in capital accumulation might be a reaction to the effects of the crisis operating through other business sectors and impacting on demand and confidence there.

#### 4. The effect of bank credit conditions on the performance of UK companies: company level analysis

The sectoral analysis provides some evidence consistent with the supply capacity of the economy having deteriorated by more in the most bank-dependent sectors of the economy. But the evidence is mixed and not conclusive by itself. If the deterioration was caused by the banking crisis then firm-level evidence should also point to consistent changes in the composition of activity among businesses. This section attempts to identify the impact of the banking sector crisis through an empirical analysis of productivity trends using information on individual businesses.

##### Framework

Increases in the productivity of private sector businesses derive from two sources: first, improvements made *within* existing businesses, perhaps due to the introduction of new capital, better technology, organisational change or by taking on or training better-skilled employees; and, second, improvements made in the types of businesses that exist, where the process of market selection encourages the exit of poor performers, the entry of highly productive newcomers and a shift in market share to more productive incumbents. In a seminal study of productivity growth in UK manufacturing from 1980-1992, Disney *et al.* (2003) found that external restructuring accounted for around half of labour productivity growth.

The importance of external restructuring in explaining a significant component of productivity growth in normal times suggests mechanisms by which credit market impairment might impact on this process and cause overall productivity growth to weaken. This arises because the process of implementing technological improvement requires capital and better-performing businesses will need more capital in order to expand.

This is likely to be more of an issue when better performing businesses are younger and financially immature. Such businesses may struggle to get access to finance without paying a substantial premium relative to financially mature businesses with a track record of retaining profits within the business and capital that may be used as collateral for loans.

Khan and Thomas (2013) set out a formal, general equilibrium model where collateral constraints limit the amount that young firms can borrow even in normal times. Such constraints prevent these young firms from reaching their desired capital stock quickly. Instead they

accumulate capital gradually and build up debt until they generate enough profits to enable them to meet further investment spending out of their own resources and begin to pay down debt. The presence of collateral constraints in this model means that capital is inefficiently allocated in that young companies have too little capital, are not as productive as they could be and take up too small a share of the economy.

Khan and Thomas show that a tightening of collateral constraints in this model can reproduce some of the salient features of the recent recession. In particular capital investment, employment and output all fall and measured labour productivity declines even though, by construction, there is no change to the technological capability of individual companies (TFP). Moreover lending to companies falls and young firms are more hindered in their investment activities relative to the pre-shock economy. Because of this they take longer to outgrow financial frictions and begin producing at a scale consistent with their capability. This brings about a change in the distribution of capital within the economy. The financially constrained companies remain smaller for longer, while unconstrained, already large companies grow larger as they expand to fill the gap left by constrained small companies. This creates greater dispersion in the marginal product of capital which highlights the gains that could be made from reallocation of capital towards the constrained. In the economy as a whole, the average marginal product of capital rises and productivity falls as the effect of lower capital investment by young firms dominates the effect of greater capital investment by mature ones.

Caballero *et al.* (2008) provide an alternative explanation for why an impaired banking sector might contribute to a slowdown in aggregate productivity. This also highlights the role of capital reallocation in the growth process. Caballero *et al.* examine the impact of the Japanese banking crisis on the macroeconomic stagnation that began in the early the 1990s. They find that it had a surprising effect on job creation and destruction. In particular they find that, rather than rising, job destruction fell in sectors where there was a disproportionate number of ‘zombie’ companies who had been kept alive by banks seeking to avoid crystallising losses. This had adverse implications for productivity.

Unlike Khan and Thomas, who treat firm entry and exit as exogenous factors, Caballero *et al.* focus on the impact on overall productivity of choices about firm entry and exit. In their model, potential new entrants have a technological advantage over incumbents, but only enter if they are likely to make sufficient profits to offset their start-up costs. Caballero *et al.* use this model to analyse the impact of bank forbearance where banks choose to protect poorly performing incumbents – so-called ‘zombies’ – from the effects of a recession. The effect is that exit of less productive firms is reduced, while entry of potentially more productive firms is deterred. The overall effect is that reallocation of capital to more productive uses is hindered and aggregate productivity is held back.

The insights from this discussion of these channels from an impaired banking sector onto companies are summarised in table 4. This highlights that an impaired banking sector is likely to impact on different types of

Table 4. Impact of an impaired banking system on businesses

Type of business	Predicted effect
Potential new entrants	<ul style="list-style-type: none"> <li>• Entry of weaker potential entrants deterred by low profitability in ‘zombie-infested’ industries</li> <li>• Productivity of entrants lower than would otherwise have been due to credit restrictions</li> </ul>
Financially immature incumbents	<ul style="list-style-type: none"> <li>• Bank borrowing unable to expand as quickly as desired</li> <li>• Capital investment held back</li> <li>• Business unable to expand at desired pace</li> <li>• Return on capital likely to be higher than average</li> <li>• Labour productivity lower than would otherwise have been</li> </ul>
Financially mature incumbents	<ul style="list-style-type: none"> <li>• Expand to fill gap left by constrained businesses</li> <li>• Can finance investment from own resources</li> <li>• Less competitive pressure from emerging businesses</li> <li>• Survival of ‘zombies’ may dampen profitability and investment intentions</li> </ul>
Poorly performing incumbents	<ul style="list-style-type: none"> <li>• Likely to have lower productivity than average</li> <li>• More likely to survive if supported by bank</li> </ul>

businesses in possibly opposing ways. It stresses the importance of looking at changes in the behaviour of different types of business in identifying the impact of an impaired banking system on productivity. In aggregate these changes should imply a reduction in measured productivity in large part because the allocation of production across firms becomes less efficient.

### Data description

To investigate this further we use data on individual businesses from the Annual Respondents Database (ARD), a micro-dataset based on a register of businesses. Data on businesses in all major sectors of the economy are available from 1997 up to 2011; data are available for manufacturing back to 1974. Further details are available in Riley *et al.* (2014).

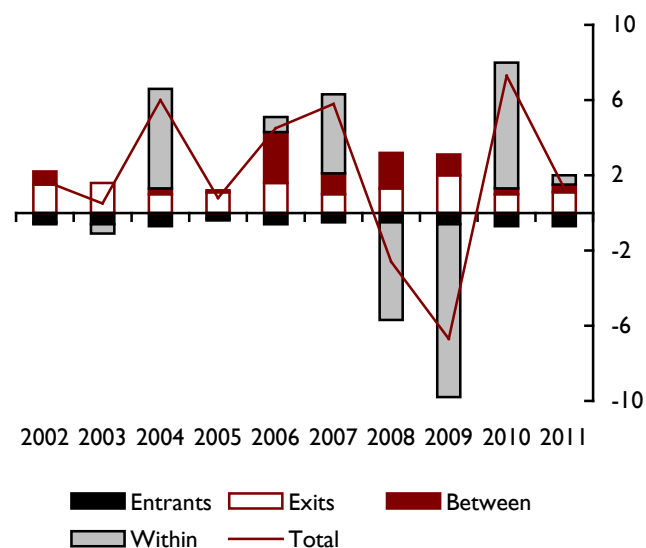
The micro-dataset shows that there is significant turnover in the business population. Looking across any two periods, businesses can be broken down into those that exist throughout the period (survivors), those that exist at the start of the period but not the end (exitors), and those that exist at the end of the period but not the start (entrants). Looking across different four-year periods (i.e. 2003–6 and 2007–10), between 65–70 per cent are survivors while around 30 per cent are entrants or exitors. Survivors tend to be larger businesses and account for around 85 per cent of total employment, whereas entrants and exitors account for 12 and 15 per cent respectively.

### Decomposition of overall productivity

If lack of access to credit and forbearance towards struggling unproductive businesses were responsible for the weakness in productivity after the crisis then this would be expected to show up in the ways set out in table 4. In particular there would be a fall in the extent to which productivity growth is explained primarily by reallocation towards stronger businesses. To assess this we use the data on individual businesses to break down overall productivity growth into four basic components, following the methodology of Griliches and Regev (1995), according to the following identity:

$$\begin{aligned}
 \text{Overall productivity growth} &= \text{average productivity growth within surviving businesses} \\
 &+ \text{reallocation towards more productive surviving businesses} \\
 &+ \text{reallocation towards new businesses} \\
 &+ \text{reallocation from exiting businesses}
 \end{aligned}$$

Figure 11. Decomposition of productivity growth in UK market sectors



Source: Annual Respondents Database, ONS, and authors' calculations.

Notes: Griliches and Regev decomposition of labour productivity. Non-agriculture non-financial market sectors excluding mining and quarrying, utilities and real estate activities. Britain. Firms are classified as live if they are active and have 10 or more persons employed.

The results of the decomposition of productivity growth on an annual basis from 2002–11 are shown in figure 11. In the pre-crisis period (2002–7), productivity growth in this sample of businesses averaged 3.2 per cent per annum. Of this, the 'within' component contributed 1.5 percentage points, while external restructuring contributed 1.7 percentage points. This is similar to the Disney *et al.* (2003) findings that on average around half of manufacturing productivity growth is accounted for by growth within companies and half by restructuring towards more efficient businesses. New entrants typically detract from productivity growth when they first begin their operations, while exits boost productivity growth reflecting the lower productivity of those going out of business relative to survivors. Year-to-year movements in productivity growth are driven largely by movements in the within-business component, both before and after the banking sector crisis.

According to the framework discussed earlier, banking sector impairment would be expected to be revealed primarily by a fall in the contribution of the reallocation components as bank-dependent dynamic businesses are prevented from growing and taking market share

Table 5. Decomposition of manufacturing productivity growth: 1988–92 and 2006–10

	1988	1989	1990	1991	1992	1990–92
Entrants	-0.5	-0.1	-0.1	0.2	-0.4	-0.3
Exits	1.2	0.8	0.7	0.5	1.3	2.5
Between	0.1	1.0	0.3	0.7	0.4	1.4
Within	6.0	-1.4	-0.5	-1.0	3.8	2.3
Total	6.8	0.3	0.5	0.4	5.0	5.9
Memo: Output	7.2	-0.2	-2.5	-6.5	-1.9	-10.9
	2006	2007	2008	2009	2010	2008–20
Entrants	-0.4	-0.1	-1.1	-0.4	-0.4	-1.9
Exits	1.8	1.9	1.1	1.2	2.0	4.3
Between	0.8	0.9	0.8	0.0	0.6	1.4
Within	1.4	6.2	-2.1	-12.1	11.2	-3.0
Total	3.7	8.9	-1.4	-11.2	13.4	0.8
Memo: Output	-0.8	3.4	-0.1	-14.7	6.8	-8.0

Source: Annual Respondents Database, ONS, and authors' calculations.

Notes: Griliches and Regev decomposition of labour productivity. Manufacturing, Britain. Firms are classified as live if they are active and have 10 or more persons employed. Output figures calculated on the same sample as labour productivity.

away from their less efficient rivals. But there is little evidence that this was the driver of productivity weakness following the banking sector crisis. As in the aggregate statistics, productivity weakened in 2008 and fell sharply in 2009. While it recovered some lost ground in 2010 and 2011, it still remained around 1 per cent below its 2007 level four years after the crisis. There does appear to have been a small fall in the reallocation components of productivity growth following the crisis, consistent with some modest direct effect of the banking crisis onto productivity growth, but the main driver of the weakness of productivity is the within-business component. This fell especially strongly in 2009, consistent with the cyclical behaviour of productivity identified in the earlier sectoral analysis. These findings are broadly in line with those reported by Barnett *et al.* (2014), although they find a slightly larger negative contribution from reallocation after the crisis.

Riley *et al.* (2014) also find that there is some evidence that the reallocation component of productivity growth fell by more in the bank-dependent industries following the crisis, also consistent with some impact of the banking crisis on productivity growth.

While the large negative contribution of the within component may reflect a typical cyclical reaction of labour productivity to the weakness of output growth and subdued capital investment, the contribution of this 'within' effect would be expected to be smaller in a banking crisis than in an equivalent-sized recession not associated with a banking crisis. To assess this,

table 5 compares the decomposition of manufacturing productivity growth in the recent recession with that of the early 1990s, which was driven largely by a tightening of monetary conditions rather than a banking crisis.<sup>4</sup>

There are some similarities in the downturns in manufacturing output and productivity growth in the recessions that began in 1990 and 2008. Manufacturing output fell very sharply in both cases and was accompanied by a slowdown in productivity growth. In the sample of businesses used for the decomposition, manufacturing productivity fell by 11 per cent in 2009 and then rose by 13 per cent in 2010, back to around its 2008 level. In the earlier recession, productivity rose on average over the years that output was falling.

But the evidence is not consistent with the banking sector crisis playing a key role in explaining the slowdown in productivity in the most recent recession. To see this, compare the decomposition of productivity over the period immediately following the recession. The final column of table 5 shows that over the period from 1990 to 1992, output in the manufacturing sector fell cumulatively by 10.9 per cent, a little larger than the cumulative fall of 8 per cent from 2008 to 2010. Despite the large fall in output, productivity rose cumulatively by 5.9 per cent in the early 1990s period, in contrast to an increase of 0.8 per cent over 2008–10, implying a much sharper reduction in employment in the earlier period. The difference in productivity performance across the two periods is almost completely due to the within component



contributing positively to productivity growth, by 2.3 percentage points, in the former period, in contrast to a negative contribution of 3 percentage points in the latter period. Indeed, external restructuring is calculated to have made broadly the same contribution to growth in the most recent recession as in the early 1990s, contrary to what would be expected if the recent productivity slowdown was driven by banking sector impairment.

This evidence casts doubt on the banking crisis being a major cause of the different performance of productivity in the most recent period. This is not to say it did not have some effect. As we have seen, there is evidence that the reallocation component of productivity growth fell by more in the bank dependent industries following the crisis. But the major driver of the weakness of productivity appears to a common factor – possibly a lack of confidence driven by uncertainty – that has not just affected businesses and sectors that are reliant on bank credit to grow.

## 5. Conclusion

This paper has explored the evidence on the extent to which the weakness in labour productivity since 2008 can be explained by the banking sector crisis.

There are good reasons for expecting there to have been some link. The slowdown in capital accumulation and weak growth since 2008 broadly match the predicted response to a credit shock of sophisticated models such as Khan and Thomas (2013). And cross-country analysis covering long spans of data such as Reinhart and Rogoff (2011) and Oulton and Sebastia-Barriel (2013) point to an empirical regularity that growth slows in the wake of banking crises.

The necessary condition for there to have been some effect appears to have been satisfied in that there is clear evidence that the banking crisis impacted on the supply of credit, especially for small companies. However, the supply of credit for large companies, who account for roughly 60 per cent of investment in the UK, was back to normal by 2011. That would have suggested the possibility of a large-company led revival in productivity growth in 2012 and 2013 if banking sector impairment had been the key factor holding back productivity growth.

More generally, we have found little clear evidence of the heterogeneity in performance between different businesses and industrial sectors that would have been expected if banking sector impairment were the main impediment to productivity growth. While sectoral

analysis suggests that output has been weakest in the most bank-dependent industries, consistent with some impact of tight credit conditions on supply capacity, the firm-level analysis suggests little change in reallocation of productivity growth across businesses. Moreover a comparison of the most recent recession and that of the early 1990s suggests that the difference in productivity is largely due to differences in productivity within businesses rather than external restructuring as might have been expected in a productivity slowdown generated by banking sector impairment. Our on-going research using company accounts data is looking at whether the slowdown in productivity within surviving businesses is more pronounced for businesses with borrowing relationships with the most distressed banks.

## NOTES

- 1 See, for example, Broadbent (2012) for an explanation of this view.
- 2 See, for example, Martin and Rowthorn (2012) for an explanation of the labour hoarding view.
- 3 The correlation between the change in output from its pre-crisis level and the pre-crisis level of loans net of deposits as a share of output is -0.5.
- 4 Young (1996) calibrates the impact of tight credit conditions on the early 1990s recession.

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