

The impact of the financial crisis on supply

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Output fell sharply in the United Kingdom during the recent global financial crisis, some of which is likely to have reflected a contraction in the economy's supply capacity. This article considers the impact of financial crises on supply and the potential channels through which supply may have been affected during the recent recession. It is likely that the downturn has resulted in a fall in companies' effective supply capacity although the magnitude of that impairment is difficult to gauge.

The financial crisis that began in 2007 precipitated a fierce recession that led, as in many other countries, to a dramatic reduction in UK output. According to the latest Monetary Policy Committee projections in the May 2010 *Inflation Report*, output is likely to remain substantially below the level implied by a continuation of its pre-crisis trend over the next three years (**Chart 1**). Much of that shortfall is likely to reflect a persistent reduction in the supply capacity of the economy.⁽²⁾ This article considers the impact of financial crises on supply and the potential channels through which supply may have been affected during the recent recession.

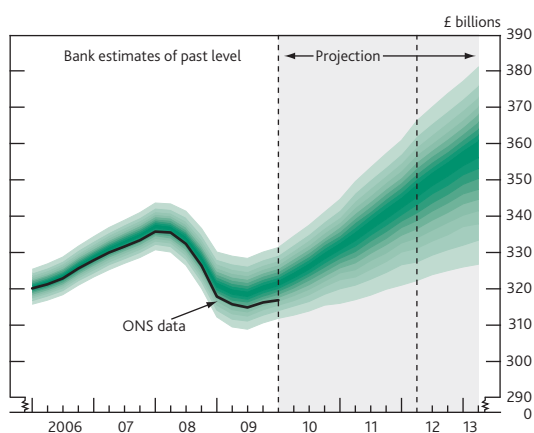
Understanding the impact of the recession on supply is important for monetary policy. In the medium term, inflation is determined by the balance between nominal demand and the effective potential supply capacity of the economy. Potential supply cannot be observed directly. But its evolution will shape both the degree of spare capacity available to companies and the slack in the labour market, which in turn influence companies' pricing and wage-setting decisions and, hence, future inflation.

A number of recent studies have examined how medium-term output and, perhaps, potential supply may have been affected by past financial crises. These are reviewed in the first section of the article. The second section explains in more detail the approach to model supply developments which is adopted in this article before the subsequent section explores the channels through which supply might have been affected. The final section concludes by briefly discussing the implications for future developments in potential supply.

Learning from the past: studies of how output responds to financial crises

The latest downturn has been triggered by an unprecedented, globally synchronised financial crisis, and many industrialised countries have experienced large falls in output. But the response of inflation depends in part on how supply capacity reacts. Consequently, several policy and research institutions around the world have published recent studies on the behaviour of potential supply.

Chart 1 Projection of the level of GDP based on market interest rate expectations and £200 billion asset purchases — May 2010 *Inflation Report*^(a)



(a) Chained-volume measure. This chart is derived from the corresponding projection for GDP growth. For a description of the Bank of England's fan chart for GDP growth, and for details of the assumptions underlying it, see the footnote to Chart 1 on page 7 of the Bank's May 2010 *Inflation Report*. The width of this fan over the past has been calibrated to be consistent with the four-quarter growth fan chart, under the assumption that revisions to quarterly growth are independent of the revisions to previous quarters. Over the forecast, the mean and modal paths for the level of GDP are consistent with the fan chart for GDP growth. So the skews for the level fan chart have been constructed from the skews in the four-quarter growth fan chart at the one, two and three-year horizons. This calibration also takes account of the likely path dependency of the economy, where, for example, it is judged that shocks to GDP growth in one quarter will continue to have some effect on GDP growth in successive quarters. This assumption of path dependency serves to widen the fan chart.

(1) The authors would like to thank Alex Haberis, Rachana Shanbhogue and Kenny Turnbull for their help in producing this article.

(2) See Section 5 in the May 2010 *Inflation Report*.

Most of these studies infer the likely response of potential supply by examining past financial crises and recessions. Potential supply is unobservable but, over time, movements in actual supply may provide a useful proxy for movements in supply capacity. Some studies draw on data sets that cover a range of countries and periods (IMF (2009a), Furceri and Mourougane (2009) and Cerra and Saxena (2008)). Others use more of a case-study approach, focusing on individual cases in greater detail (European Commission (2009) and OECD (2009)). In summarising this literature, three broad findings emerge.

First, financial crises are associated with a persistent loss of output relative to its level had the crises not occurred (Table A). Estimates of the size of output loss differ, reflecting differences in both methodology and coverage. For example, the IMF (2009a) estimates an average output loss of 10% relative to a trend level, while research from the OECD suggests the impact is much smaller on average, at around 2% (Furceri and Mourougane (2009)).

Table A Output losses following financial crises

Study	Change in output	Description
IMF (2009a)	-10%	Average output loss seven years after a financial crisis.
Cerra and Saxena (2008)	-7.5%	Average output loss ten years after a financial crisis.
Furceri and Mourougane (2009)	-1.5% to -2.4%	Average loss in potential output five years after a financial crisis.

Sources: Cerra and Saxena (2008), Furceri and Mourougane (2009) and IMF (2009a).

Second, experiences differ widely across countries. For example, even setting to one side the more extreme responses in the IMF (2009a) study, the range of impacts for the central half of cases was no less than -26% to +6%. The response of different economies appears to depend on certain characteristics, such as the demographic and industrial structures of the country and its political system, as well as on the fiscal and monetary policy response to the crisis. In some cases, the impact on supply has been more persistent than in others. For example, there appeared to be a persistent impact on growth in Japan following the financial crisis in the early 1990s so that the size of the output loss grew over time.⁽¹⁾ But there appeared to be only a temporary impact on output growth in Finland and Sweden following their financial crises (European Commission (2009) and Haugh *et al* (2009)).

Third, output losses tend to be bigger and longer lasting when recessions are accompanied by financial crises, as compared with normal recessions. For example, research from the OECD found that output losses after severe financial crises are typically around two times greater than after less severe crises (Furceri and Mourougane (2009)). The IMF (2009b) also found that recessions associated with financial crises are longer and

generally more costly than others. Reinhart and Rogoff (2009) also highlight the persistent weakness in output following financial crises. With all these studies, however, differentiating between the impact of a financial crisis and a 'normal' recession is difficult given that financial crises can frequently be accompanied by recessions.

While these explorations of past crises can provide a useful benchmark for the most recent episode, the results should be treated with some caution. Actual output is a useful proxy for potential supply only once inflation has stabilised and the economy has regained the balance between demand and potential supply. And the size of output loss is typically measured relative to an estimated pre-crisis trend path, which is difficult to pin down. For example, estimates that extrapolated the pace of growth immediately prior to the crisis may inadvertently include periods of unsustainably high growth, which can lead to overestimates of the size of output loss.

Despite these difficulties, most of the available evidence suggests that financial crises and associated recessions have a negative and long-lasting effect on the supply capacity of the economy. In particular, among estimates for the United Kingdom in the context of the current crisis, in their *Green Budget*, the Institute for Fiscal Studies (2010) estimated a persistent output loss of around 7½%. This is greater than HM Treasury's (2010) estimates, which pointed to a deterioration in supply of around 5%. The remainder of the article goes on to examine the channels through which supply in the United Kingdom may have deteriorated during the recent financial crisis and associated recession.

Medium-term potential supply from the growth accounting approach

Although potential supply is unobservable, there are a number of approaches that can be used to estimate it. Some of these imply measures that respond more quickly to changes in the economic environment than others (see the box on page 106). This article focuses on a concept of potential supply built up from the component parts — labour supply, capital services and productivity — and so is consistent with a 'growth accounting' approach.⁽²⁾ This approach acknowledges that movements in supply — like output itself — may be influenced by the business cycle, and so it is well suited for analysing the effects of the crisis and the recession on supply.

An example of this framework can be seen by decomposing changes in *actual* GDP. But it is important to recognise that this only provides a decomposition of *actual* supply and not

(1) Extrapolating high growth rates in Japan prior to the crisis may, however, lead to an overestimate of the effects of the crisis.
 (2) For an example of this approach, see the box entitled 'The impact of the dislocation in financial markets on potential supply' on page 28 of the May 2008 *Inflation Report*.

Concepts of supply

Conceptually, it is relatively straightforward to measure how much companies are producing and, hence, their *actual* output or supply. But it is much harder to gauge the quantity companies would ideally like to produce given the economic environment, and how that may evolve over time. This is unobservable and hence must be inferred. This box explores a number of different ways to estimate potential supply.

Three broad approaches to measuring potential supply have been identified in the economics literature. They can be classified according to the speed with which potential supply responds to changes in the economic environment. At one end of the spectrum are trend-fitting approaches, which treat potential output as relatively slow moving. At the other end of the spectrum are those approaches in which short-term factors are allowed to affect potential supply, resulting in volatile estimates. In between is the 'growth accounting' approach.

Trend-fitting approaches use a variety of statistical techniques to estimate potential supply. These techniques typically smooth through variations in output, resulting in estimates of potential output growth that are close to some historical average and relatively slow moving. Examples include linear trend estimates, first differencing, fitted polynomials in time, peak-to-peak interpolation, and Hodrick-Prescott and band-pass filters.⁽¹⁾ While these methods provide useful practical estimates, they usually have little basis in economic theory. They are also sensitive to the choice of sample period over which they are estimated, with more recent estimates — which are of greater relevance for policymakers — particularly susceptible to subsequent revision.

An alternative approach is a 'bottom-up' analysis. The amount that a business can produce depends on the number of people it employs, along with its capital or technical infrastructure. But its output will also depend on the efficiency with which its workforce can use the technology available — the company's total factor productivity. The 'growth accounting' approach

potential supply. It reflects what inputs go into meeting the current level of demand with domestic output.

Much of the variation in output over the economic cycle reflects movements in total factor productivity (TFP) (Chart 2), which, in theory, captures the efficiency with which businesses can combine labour and capital to produce output. But TFP is unobservable and so, in practice, is estimated as a residual. The strongly procyclical pattern to TFP may reflect a range of factors. For example, companies may be reluctant to lay employees off during economic downturns due to the

uses this framework to analyse how these components, and hence aggregate supply, evolve over time.

Under the third approach, short-term factors are allowed to affect businesses' potential supply. For example, models (such as those in the 'New Keynesian' literature) can be used to measure potential supply as the 'flexible price level of output' — that is, the level of output that would exist if prices were able to change immediately. In this case, sudden changes to the real economy can result in sharp movements in estimates of potential supply. And since these changes are unlikely to be smooth, neither will be the path of potential output. As a result, variations in potential output account for a greater degree of the variation in actual output.⁽²⁾

An alternative concept in which short-term factors can influence supply is based on the notion that companies may be constrained by difficulties in accessing finance. Businesses typically use working capital to fund their day-to-day business activities. But if credit lines dry up and businesses are unable to access working capital, they may be constrained in the amount they can 'effectively' supply.⁽³⁾ Working capital can, in theory, be analysed within the growth accounting framework as another factor that companies need to produce output. And quantitative theoretical models can also be constructed that shed light on the impact of the working capital channel.⁽⁴⁾

Finally, during periods of rapid restructuring, the supply capacity of the economy may be reduced if it is costly and takes time to shift production to newer, faster-growing sectors. This is another way in which potential supply may be affected in the near term and is sometimes referred to as 'speed limit effects' (Walsh (2003)). Seminal work in this area is attributable to Gordon (1980), who argued that US inflation is better explained when considering the rate of change of a measure of potential supply.

(1) See, for example, Hodrick and Prescott (1997), Canova (1998), Stock and Watson (1999) and Christiano and Fitzgerald (2003).

(2) See, for example, Neiss and Nelson (2005).

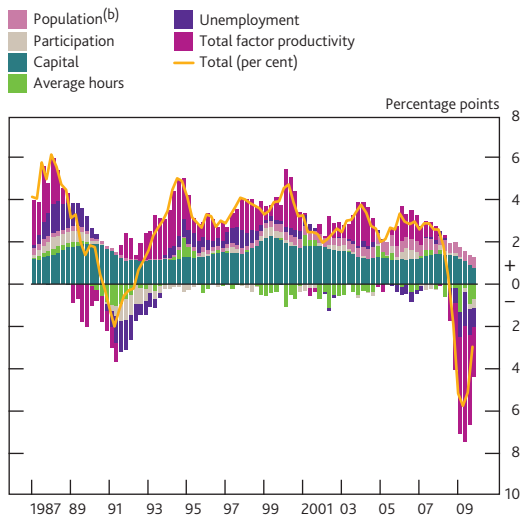
(3) See Blinder (1987) for a discussion of 'effective' supply.

(4) See, for example, Kiyotaki and Moore (2008).

costs associated with changing headcount.⁽¹⁾ This will be reflected in lower productivity and hence weaker TFP. In contrast, during periods of economic expansion, employees generally raise levels of effort and capital is used more intensively. These variations in the intensity with which companies use their labour and capital may not be captured in the headline capital and labour input data, and will show up instead as higher TFP.

(1) For a comparison of the response of the labour market in this recession relative to previous downturns, see Faccini and Hackworth (2010).

Chart 2 Contributions to annual growth of actual supply^{(a)*}



Sources: ONS (including the Labour Force Survey) and Bank calculations.

(a) Chained-volume measure of gross domestic product at market prices. The decomposition is only available to 2009 Q4.

(b) Population data are non seasonally adjusted.

* This chart differs from the version originally published, for which the participation and total factor productivity bars were slightly different.

Much of the remainder of the variation in output reflects changes in unemployment. In particular, the fall in actual output during the early 1990s recession was accompanied by higher unemployment. Faced with lower demand for their products, some businesses may lay off employees during economic downturns. Alongside this, the average number of hours worked typically falls back in recessions as companies look for ways to adjust the amount of labour input. And the share of the population willing to work also tends to fall back in recessions as people become discouraged about their chances of finding a job.

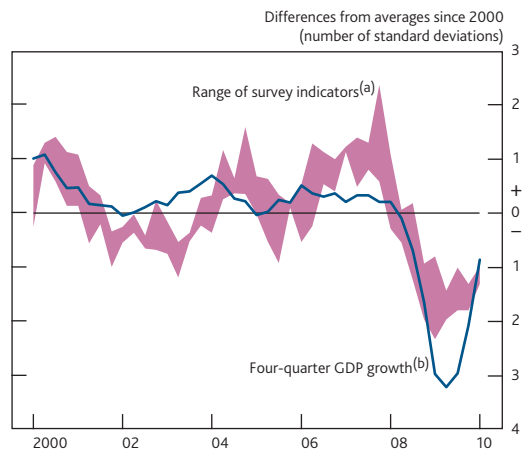
Translating this framework into an estimate of *potential* supply is, unfortunately, much more difficult. In any economy, the level of potential output is a moving target, partly because the economy grows over time, but also because changing circumstances have effects in the medium term. So the level of potential supply can be thought of as an equilibrium path towards which actual output will tend to gravitate in the medium term. Medium-run values of different supply components can be estimated, but they are not directly observable. Therefore, an assessment of how these medium-run values are likely to change will be based on economic theory and how the current values of the inputs evolve. The next section will use this growth accounting approach to explore the channels through which *potential* supply may have been affected in the recent recession.

The impact of the financial crisis and recession on potential supply

Overall, it is likely that the effective supply capacity of the economy has been impaired since the start of the financial

crisis. Inflation has been resilient. And surveys of capacity utilisation do not appear to have fallen by as much as the fall in output might suggest (Chart 3). This section uses the growth accounting framework to examine the channels through which each component of supply — labour, capital and the TFP residual — might have been affected in the recession.

Chart 3 GDP growth and capacity utilisation surveys



Sources: Bank of England, British Chambers of Commerce (BCC), Confederation of British Industry (CBI), CBI/PricewaterhouseCoopers and ONS.

(a) Three measures are produced by weighting together surveys from the Bank's Agents (manufacturing and services), the BCC (manufacturing and services) and the CBI (manufacturing, financial services, business/consumer services, distributive trades) using shares in nominal value added. The BCC data are non seasonally adjusted.

(b) Chained-volume measure at market prices.

Labour supply

The amount of labour used to produce goods and services can be measured by the total number of hours worked in the economy. This can be decomposed into: (i) the size of the population; (ii) the share of that population willing and able to work; (iii) the share of those people actually in work; and (iv) the average number of hours worked by those employed.⁽¹⁾ But for *potential* supply, it is the medium-term equilibrium levels of these components that are most relevant.

Size of the population

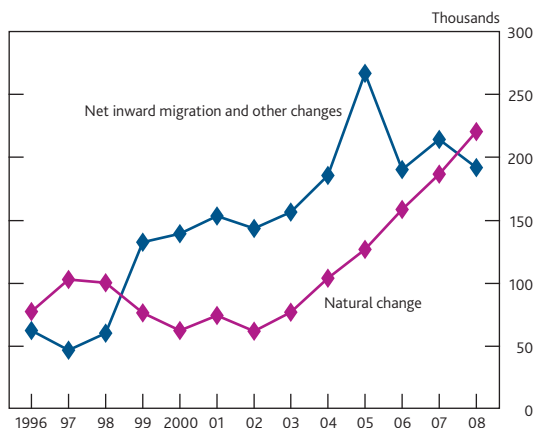
Population growth has been relatively strong in recent years, and is likely to have made a significant contribution to the growth of potential labour supply in the United Kingdom. Rising population can reflect either natural change or increases in net inward migration, both of which have picked up over the past decade (Chart 4). In 2008, natural change exceeded net inward migration for the first time in nine years, as net inward migration edged down and births continued to rise.

Natural change in the population, influenced by changes in fertility, life expectancy and age composition, typically occurs quite slowly.⁽²⁾ And these changes are unlikely to be very

(1) As the arguments for how 'potential hours' might respond in a recession can work in either direction, we do not explicitly discuss this component.

(2) See Barwell *et al* (2007).

Chart 4 UK population growth: net inward migration and natural change

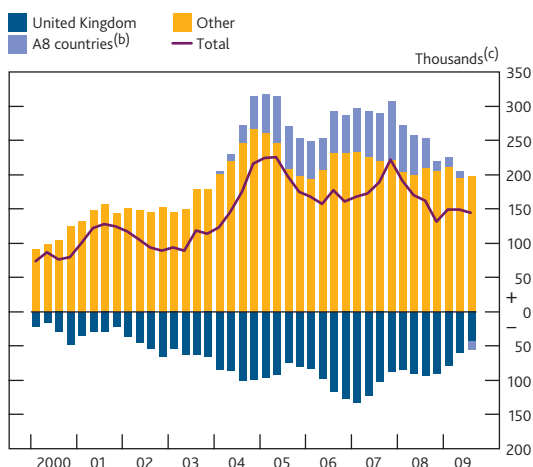


sensitive to the economic cycle. But the degree of net inward migration is likely to have stronger links with the state of the economy.

Inward migration increases the population directly. And it may have a further impact on labour supply if immigrants differ from the typical UK resident (and those leaving the United Kingdom) in terms of how likely they are to participate in the labour market.⁽¹⁾ The incentive to migrate may partly reflect cyclical differences in wages and the probability of finding work in different countries. During periods of relative cyclical weakness, net inward migration may therefore be lower than otherwise.

The financial crisis has been a global phenomenon. So while the cyclical position of the UK economy has been affected, it is less clear to what extent it has changed relative to other

Chart 5 Estimates of net inward migration by citizenship^(a)



Source: ONS International Passenger Survey.

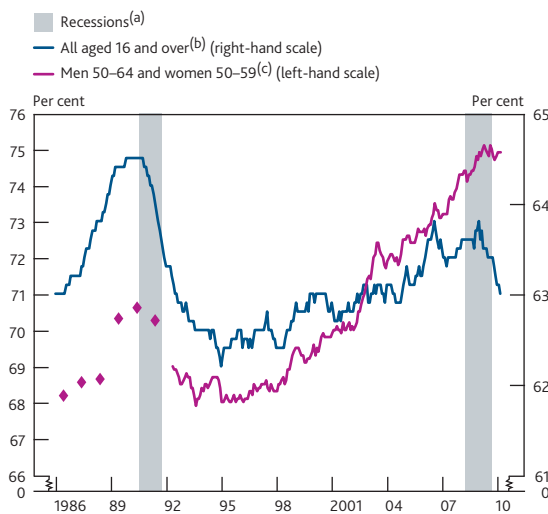
(a) Estimates of net long-term international migration by citizenship. Data are non seasonally adjusted. 2009 data are provisional, and are available up to 2009 Q3.
 (b) The A8 countries are the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Prior to 2004, net inward migration from the A8 is included in the 'Other' bar, because the split between net inward migration from the A8 and from other countries is not available.
 (c) Rolling four-quarter sum.

countries. If the attractiveness of the United Kingdom as a destination for migrants had declined, then that would be consistent with the slowdown in net inward migration indicated by ONS data up to 2009 (Chart 5). In addition, sterling's depreciation — of around 25% since the start of 2007 — will have made nominal pay in the United Kingdom worth less in terms of foreign currencies, which may also serve to discourage net inward migration.

Participation

The proportion of people that are willing and able to work is an important element of labour supply. The participation rate — the number of people working or seeking work, as a percentage of the adult population — tends to fall during an economic downturn (Chart 6) for a number of reasons.⁽²⁾ For example, individuals may be discouraged from looking for work during a recession when the likelihood of finding a job is lower. Reduced job opportunities may imply a stronger motive to do 'non-market' work, such as caring for relatives or investing in education as an alternative. And weaker real wage growth may mean people are less willing to supply labour.

Chart 6 Participation rates



Source: ONS (including the Labour Force Survey).

(a) Recessions are defined as at least two consecutive quarters of falling output (at constant market prices) estimated using the latest data. The recessions are assumed to end once output began to rise.
 (b) Percentage of the 16+ population. Rolling three-month measure.
 (c) Percentage of the population aged 50-64 for men and 50-59 for women. Rolling three-month measure. The observations before 1992 are based on non seasonally adjusted, annual LFS microdata. The annual observations correspond to the March-May quarter.

Recessions may, however, have other effects that actually encourage participation in the labour market. The reduction in equity prices and financial wealth that marked the early stages of the current recession would make financing retirement, or leisure more generally, more difficult for instance. That may have pushed up on the participation rate of older workers in particular (Chart 6).⁽³⁾

(1) See Saleheen and Shadforth (2006) and Barwell (2007).
 (2) See Gomes (2009) for evidence of the cyclicity of UK labour market flows.
 (3) For a further discussion of recent trends in participation, see Faccini and Hackworth (2010).

These changes in actual participation can in turn affect medium-term participation. For example, some people who leave (or choose not to enter) the labour force may be less able to retain or acquire the skills sought by employers. And decisions to enter education, retire, or look after the family or home may not be easily reversed.

The impact of the crisis and the recession on medium-term participation may, however, be smaller now than in the past. In the early 1990s, institutional features — such as the availability of early retirement packages and access to disability benefits — are thought to have encouraged declining participation of older age groups (Chart 6). But the availability of these features has been scaled back significantly. That too could account for the most recent data in which the impact on participation appears, so far at least, to have been relatively muted. Furthermore, the fall in participation since early 2008 has been more than accounted for by those under 25 years old, many of whom may have re-entered education. To the extent that these people eventually return to the workforce, with improved skills, that may serve to attenuate some of the fall in supply potential.

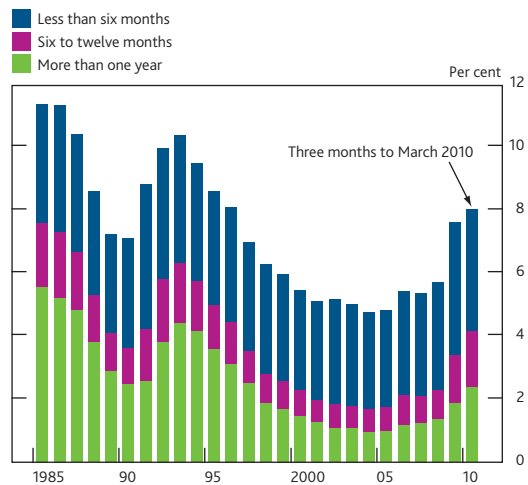
Unemployment

A defining feature of an economic downturn is a pronounced rise in unemployment. This can give rise to a risk of increased labour market ‘mismatch’, whereby people who are out of work for longer spells see their skills deteriorate, meaning they may no longer have the appropriate expertise looked for by businesses. Alternatively, the unemployed may simply be living too far away from companies that would like to hire them and regional mobility may be limited. Mismatch could be further exacerbated by large-scale restructuring of economic activity away from some industries (such as property-related sectors) and towards others (such as the export sector), meaning that the unemployed do not possess the skills, training or experience to quickly take up positions in faster-growing industries.

Economic studies have used labour market mismatch to help explain the rise and persistence of unemployment across Europe in the 1980s. This raised the possibility that the labour market was subject to ‘hysteresis’, whereby temporary events have long-lasting effects.⁽¹⁾ These effects, triggered by a cyclical rise in unemployment, could manifest themselves in people remaining unemployed for longer, which may in turn lead to higher equilibrium unemployment.

In the United Kingdom, the long-term unemployment rate is currently lower than in the mid-1980s and early 1990s (Chart 7), although it has continued to rise in recent months. The lower level of long-term unemployment indicates that any hysteresis-type effect may be smaller than suggested by previous experiences. But there remains considerable uncertainty about how the labour market will evolve and,

Chart 7 Unemployment rate by duration^(a)



Sources: ONS (including the Labour Force Survey) and Bank calculations.

(a) Annual data. Data prior to 1992 are based on LFS microdata. These annual observations correspond to the March-May quarter.

given the rise in the unemployment rate to 8%, there remains a risk that long-term unemployment might rise further.

Capital

The supply capacity of the economy depends in part on the amount of capital available to companies. Theoretically, capital includes a range of inputs, including both tangible assets — such as plant and machinery, buildings, vehicles and information technology — and intangible assets — such as copyrights, patents, trademarks and alike. In practice, the official data may not properly capture the importance of all of the assets.⁽²⁾ In the very long run, there is an equilibrium level of capital services, the size of which depends on fundamental influences such as the level of technology, the size of the population and the level of global interest rates. Over long time periods, businesses may adjust their actual capital holdings towards this desired level. But a more relevant measure for how much could be produced by businesses now — and, hence, potential supply — is the current level of capital available to them. Capital may be affected through gross investment, scrapping and asset-life lengthening, each of which will now be examined.

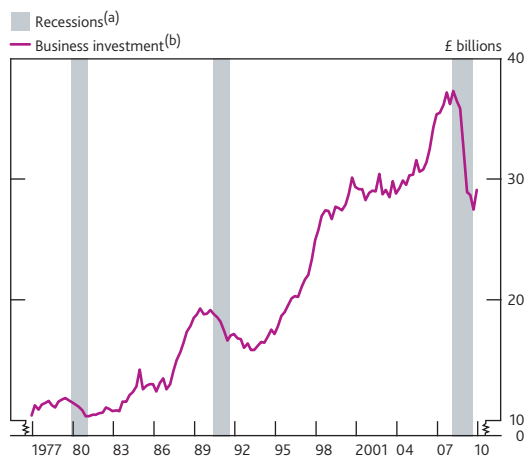
The obvious channel through which capital can be affected in a recession is through lower business investment. This tends to fall sharply during downturns (Chart 8) as companies revise down their expectations of future demand and become unwilling to invest in an uncertain economic climate. Investment has been particularly weak during the recent recession, perhaps reflecting an additional impact from the financial crisis. Companies may have found it more expensive

(1) See Blanchard and Summers (1986), Jackman and Roper (1987) and Layard, Nickell and Jackman (1991).

(2) See Marrano and Haskel (2006). The composition and quality of capital assets which are not properly captured in capital data are likely to affect aggregate TFP measurement.

to access the external funding they need to finance investment projects and, in some cases, they may not have been able to access external finance at all. Although business investment flows are small relative to the size of capital services, the unprecedented decline in business investment during the recession will have materially weakened capital services growth.

Chart 8 Business investment and recessions



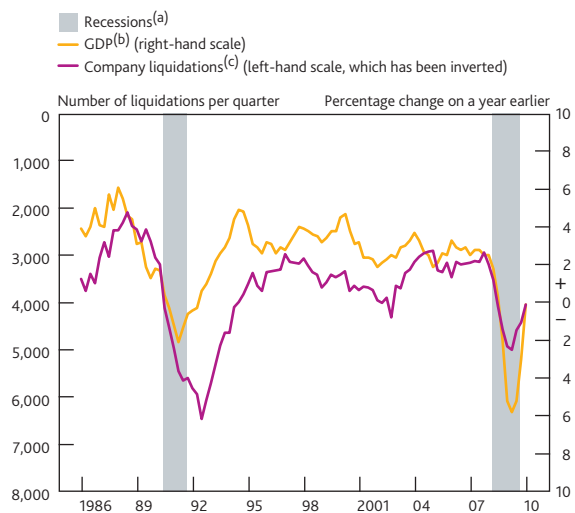
(a) Recessions are defined as in Chart 6.
(b) Chained-volume measure.

The implications of weak investment spending depend primarily on the extent to which investment projects have been deferred into the future rather than abandoned altogether. If companies decide to go back to projects that were previously postponed, strong investment in the recovery may partly compensate for the weakness in the recession. But past experiences show that investment is often slow to recover, perhaps reflecting some build-up of excess capacity, meaning that the impact on the level of capital services may persist.

A second channel through which capital can be affected is changes in its lifespan. Recessionary periods tend to lead to a rise in company liquidations (**Chart 9**). Some of the capital held by such distressed companies may be scrapped, rather than sold in a secondary market. Such capital scrapping appeared to occur in the early 1980s when assets, particularly plant and machinery in manufacturing, were scrapped before their normal service lives were reached.⁽¹⁾

The rise in liquidations during the recent recession, however, appears more moderate than might have been expected given the fall in output and the depth of the financial crisis (**Chart 9**). That may be a result of a relatively healthy position of the corporate sector prior to the crisis, or increased forbearance on the part of the banks and tax authorities. Or it may reflect the policy response of both the monetary and fiscal authorities to the crisis. Lower-than-expected corporate liquidations may indicate that premature scrapping has had less of an impact on

Chart 9 Company liquidations in England and Wales



Sources: The Insolvency Service and ONS.

(a) Recessions are defined as in Chart 6.
(b) Chained-volume measure at market prices.
(c) Data are to 2010 Q1. Changes to legislation, data sources and methods of compilation mean the statistics should not be treated as a continuous and consistent time series. Since the Enterprise Act 2002, a number of administrations have subsequently converted to creditors' voluntary liquidations. These liquidations are excluded from the headline figures published by The Insolvency Service and excluded from the chart.

capital than has been typical in the past. Official capital stock data do try to capture capital scrapping (drawing on information on corporate default rates) but this is a difficult process. So there remains considerable uncertainty surrounding capital measures in the presence of premature scrapping.⁽²⁾

Set against the capital scrapping effect during a downturn is the possibility that, for those businesses that remain active, the effective lifetime of the installed capital may increase. For example, companies may choose to hold on to their machines for longer as reduced utilisation leads to less wear and tear. For any given level of investment, such asset-life lengthening would thus raise the level of available capital services.

The net effect on supply through changes in the lifespan of capital is ambiguous given that these capital scrapping and life-lengthening channels point in different directions. But given that insolvencies have remained relatively low, this suggests that this channel through to potential supply is weaker than in the past.

Productivity (TFP)

Much of the variation in actual output over the cycle appears to reflect changes in the efficiency with which companies combine their labour and capital inputs: their total factor productivity (TFP). So movements in potential output might also be expected to reflect movements in equilibrium TFP. Some of the channels fit neatly into the typical description of TFP. But others reflect factors that are not properly accounted

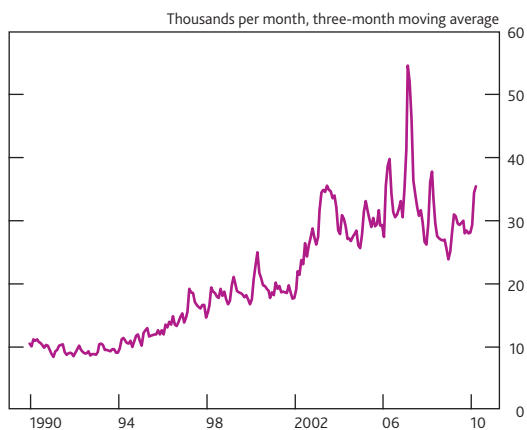
(1) See Oulton and Srinivasan (2003) for a general discussion of scrapping.

(2) See ONS (2009).

for when measuring other inputs and so, by default, are captured in the TFP component. In broad terms, TFP is a residual that may reflect not only trend productivity growth, but other factors, such as the quality of capital and labour and influences from working capital. Below we discuss the main channels through which TFP may be affected.

First, TFP may have been adversely affected by a reduction in the number of new businesses. For example, prospective businesses may have found it harder to access the funding they need to start trading. This effect may have been exacerbated in the recent period given the financial nature of the shock. These businesses may be particularly important as a source of productivity growth, through the implementation of new technologies for instance. And they may also increase competition, forcing existing businesses to improve their operating efficiency. However, after falling around the start of 2008, company incorporations have started to rise again (Chart 10), perhaps indicating that the effect on TFP through lower start-ups was relatively small during the recent recession.

Chart 10 Company incorporations^(a)



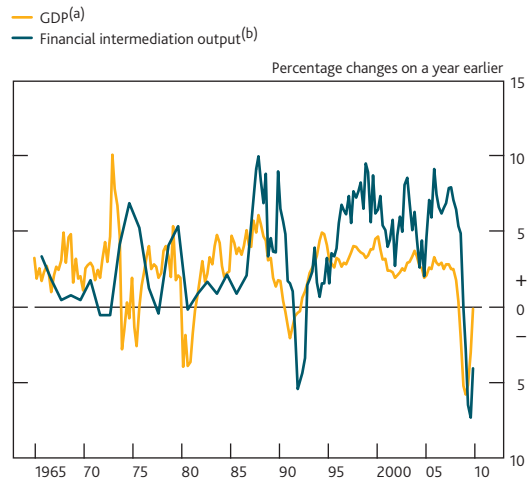
Source: Companies House.

(a) Data are for Great Britain and are non seasonally adjusted.

Second, certain features of the recession may exacerbate the impact on productivity, particularly if it is more productive sectors that are exposed. For example, productivity in the financial sector may have fallen back in the recent recession as lower demand for financial products stymied innovation. As measured by the ONS, financial sector output grew rapidly from the mid-1990s onwards (Chart 11). To the extent that the pace of growth of this sector may be lower following the crisis, overall output growth may be weaker. More generally, sterling's depreciation may have reduced the threat from foreign competitors, lowering the incentive for businesses operating in the most open UK markets to increase efficiency.

A third channel through which measured TFP might be affected is through changes in inputs that are unobservable, or difficult to measure. These could be intangible investment

Chart 11 Financial intermediation output and GDP



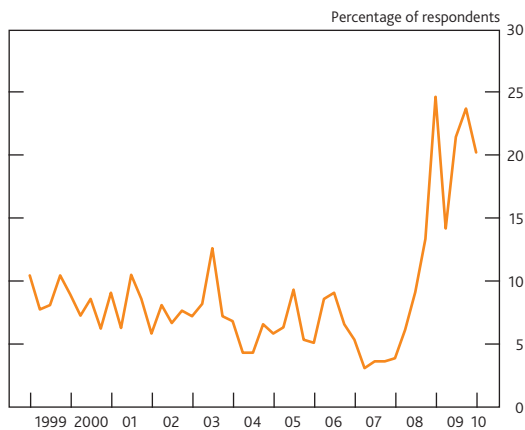
(a) Chained-volume measure at market prices.
(b) Data prior to 1987 Q4 are annual.

assets, such as copyrights or patents, which would perhaps be more appropriately reflected in measures of capital or labour. Indeed, research suggests that intangible assets would, in reality, probably form a large part of investment (Marrano and Haskel (2006)). But they can be difficult to measure, meaning that their effects frequently show up in measured TFP. Businesses may cut back on these intangible investments during recessions, mechanically lowering measured TFP growth. And there may also be channels through to structural TFP, for example if lower spending on training reduces individuals' productivity growth.

A fourth channel through which *measured* TFP might be affected is the working capital channel. Businesses require working capital to fund their day-to-day activities. This can come from a combination of internal cash flow, including liquidating inventories (Benito (2005)), bank borrowing or trade credit.⁽¹⁾ The tightening of corporate credit conditions that resulted from the financial crisis may have made it harder and more expensive for businesses to obtain working capital. In a growth accounting framework, this impairment to 'effective' supply would show up in a weak TFP residual.

In turn, there are three main routes through which a reduction in working capital might affect potential supply. First, businesses' production processes may be disrupted without access to sufficient working capital, meaning that the quantity that they can *effectively* supply shrinks. Survey evidence certainly indicates that tight credit conditions may have made it hard for some businesses to meet orders: the proportion of businesses in the CBI surveys reporting that external finance was limiting output remained elevated throughout 2009 and into 2010 (Chart 12).

(1) See the box on page 15 of the February 2009 *Inflation Report* for further details on trade credit.

Chart 12 Credit and finance as a constraint on output^(a)

Sources: CBI and ONS.

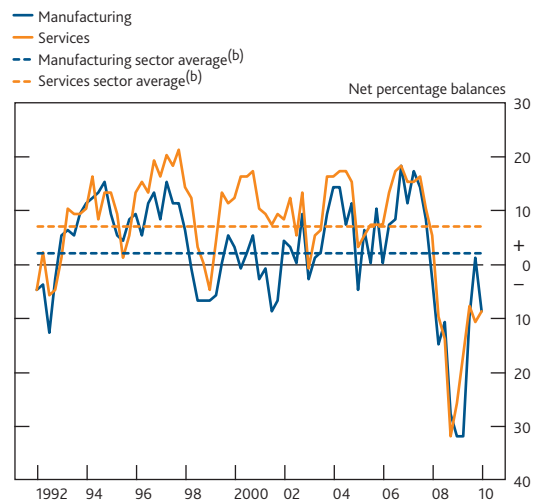
(a) This measure is produced by weighting together balances for the manufacturing sector and the consumer/business service sector using shares in nominal value added. Manufacturing companies are asked: 'What factors are likely to limit output over the next three months?'. Service sector companies are asked: 'What factors are likely to limit your ability to increase the level of business over the next twelve months?'.

Second, the higher cost of working capital will naturally lead to a rise in businesses' production costs. With more expensive credit, some businesses will need to pay a higher cost when they borrow to cover wages and intermediate inputs. As a result, the effective price of these inputs will increase and businesses may use fewer of them, thus lowering production levels. In this way, potential supply might be adversely affected via the cost channel.

In addition, businesses' need for working capital may lead them to divert funds from other activities, indirectly affecting potential supply. For example, if businesses finance their short-term operations with funds previously intended for capital expenditure, business investment will be weaker than otherwise. While this lowers demand, it would also reduce supply through weaker capital services growth. Businesses whose activities or financial structure are considered more risky may find it particularly difficult to access working capital. To the extent that these businesses are a more significant source of dynamism and technical progress, reductions in working capital would reallocate resources from more to less productive companies, thus lowering the average level of productivity.

There is considerable evidence to support this picture of businesses facing working capital constraints. Both the British Chambers of Commerce (BCC) survey and the *Deloitte CFO Survey* pointed to businesses having to deal with severely constrained cash flow. The BCC cash-flow scores fell to record low levels (**Chart 13**). And chief financial officers in the *Deloitte CFO Survey* reported that increasing cash flow would be a top priority in 2010 (**Chart 14**).

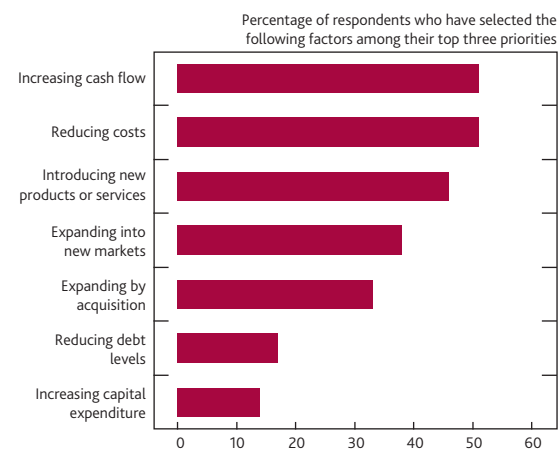
A shortage of working capital is likely therefore to have played a significant role in constraining the output of some

Chart 13 Survey indicators of businesses' cash-flow positions^(a)

Sources: BCC and Bank calculations.

(a) Companies are asked: 'During the last three months how has your cash flow changed: improved/same/worsened?'.

(b) Averages since 1992.

Chart 14 Chief financial officers' top priorities in 2010^(a)Source: *The Deloitte CFO Survey 2009 Q4*.

(a) Deloitte asked CFOs to select their top three priorities for 2010 from a list of ten. The score for each factor above is the percentage of CFOs that have included the factor in their top three priorities. The chart shows the top seven factors selected by CFOs.

companies. But this effect is unlikely to persist as working capital constraints ease.

Implications for the evolution of potential supply

The path of potential supply is a key concern for monetary policy makers. But potential output is difficult to measure as it is both unobservable and can be defined in a number of different ways. As such, it is easy to see why competing studies provide such a wide range of estimated effects. This article has applied a growth accounting 'bottom-up' approach to understand the channels through which supply may have been affected during the recent UK recession.

It is likely that the downturn has resulted in a fall in companies' effective supply capacity through a number of the channels described above. That is consistent with both the resilience in inflation and survey estimates of spare capacity within companies. In particular, both capital and labour inputs are likely to be negatively affected, and the efficiency with which these inputs are combined may have also deteriorated somewhat.

The developments observed in the data can shed some light on the relative impact these channels have on supply. In particular, relative to the decline in output, employment has fallen by less than in previous recessions. That suggests the deterioration in equilibrium employment may be less acute relative to past experiences. Similarly, although the number of insolvencies has risen, it has so far done so by less than might be expected given the fall in output, pointing to less capital scrapping than may have been expected. Other evidence, however, points to larger effects on supply. Investment has fallen substantially in the recession, pushing down on the level of capital services available to businesses. And the available evidence indicates that companies' working capital is likely to have restricted their effective supply. But significant uncertainty remains around the extent to which supply capacity has been impaired through all of these channels.

Future developments in supply also remain uncertain. If credit conditions ease, working capital effects on supply are likely to dissipate quickly. Also, if the economic recovery proves robust, some of the negative supply effects may be more muted than expected, while others may be partly reversed. Indeed, according to a recent survey by the Bank's Agents, most companies appear not to have permanently reduced their supply capacity.⁽¹⁾ For example, a majority of businesses reported that they could increase output by more than 5% without a material increase in recruitment or capital expenditure. However, if demand growth proves anaemic, the effects of higher unemployment and lower participation on labour supply, together with increased capital scrapping and cancelled investment projects, would bear down more persistently on the economy's supply potential.

Given this uncertainty, monitoring the supply side of the economy will, as ever, be vital in assessing the balance between aggregate demand and aggregate supply. Such an assessment, and associated monetary policy actions, is necessary to ensure that the inflation target is met in the medium term.

(1) For further discussion, see page 31 of the May 2010 *Inflation Report*.

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