

# In search of lost British productivity

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*After forty years of regular, stable growth in productivity averaging 2.4% per year, the British economy experienced a slump in average output per worker in 2008 and this output has only picked up slightly since. British productivity today is 16% lower than its pre-crisis trend. While this phenomenon can also be seen in many other European countries, including France and Germany, it is far more marked in the United Kingdom.*

*As in France and Germany, this abrupt halt in productivity in the United Kingdom is only marginally explained by the usual productivity cycle: the economic crisis was five years ago, far longer than the usual period for adjustments of employment. Nor does it stem from structural effects: calculated by breaking the economy down into nine sectors, the sectoral reallocation of jobs has made a negligible contribution to productivity gains. Additionally, the increase of self-employment and part-time contracts has a marginal effect on the productivity puzzle.*

*Three reasons can be isolated, and cumulatively they explain 50 to 75% of the slowdown in productivity in the United Kingdom:*

*- while the slowdown in productivity has been observed in each of the nine sectors of the economy, it is particularly sharp in the oil sector (due to the gradual exhaustion of reserves) and the financial sector (bursting of the bubble);*

*- corporate investment, particularly in capital goods, has seemed particularly weak since the start of the 2000s and this has probably taken its toll on the labor productivity;*

*- the adjustment of wages has been very swift and sharp since 2008, to the extent that real wages have fallen by 7% in five years, while they have actually grown in France and in Germany. This adjustment has been accelerated by an increase in the labour force induced by changes to the rules governing retirement and eligibility for minimum welfare benefits; it may have encouraged firms to adopt processes that are more capital effective and less labour effective.*

*A fourth reason is sometimes put forward: capital may have been insufficiently reallocated since the crisis. Indeed, on the one hand the massive stimulus measures to support companies in difficulty appear to have brought down the number of bankruptcies, and on the other hand there may have been insufficient financing for growth sectors. This explanation is theoretically attractive but has yet to be validated empirically. Additionally, it is not, a priori, specific to the United Kingdom while the decline of productivity is particularly significant.*

*Some of these factors are temporary by nature and should not affect British productivity in the long run (it is the case of the usual effect of the productivity cycle). Conversely, other shocks are affecting both the productivity level itself and the trends in productivity gains: British productivity was boosted by the oil sector in the 1990s then by the financial sector in the 2000s, against a backdrop of the credit bubble and those factors will stop influencing in the coming years. However, the key explanations (rise in labour force participation rates, under-investment, poor capital allocation) point to a sense that the productivity puzzle is mainly a sharp drop in level but that the marked slowdown in productivity gains could appear for the most part to be temporary. And the upturn in activity since the start of 2013 has led to a clear pick-up in productivity (+0.4% on average per quarter). ■*

# In search of lost British productivity

## British productivity has declined since the crisis

### Sharp drop in British productivity since 2008

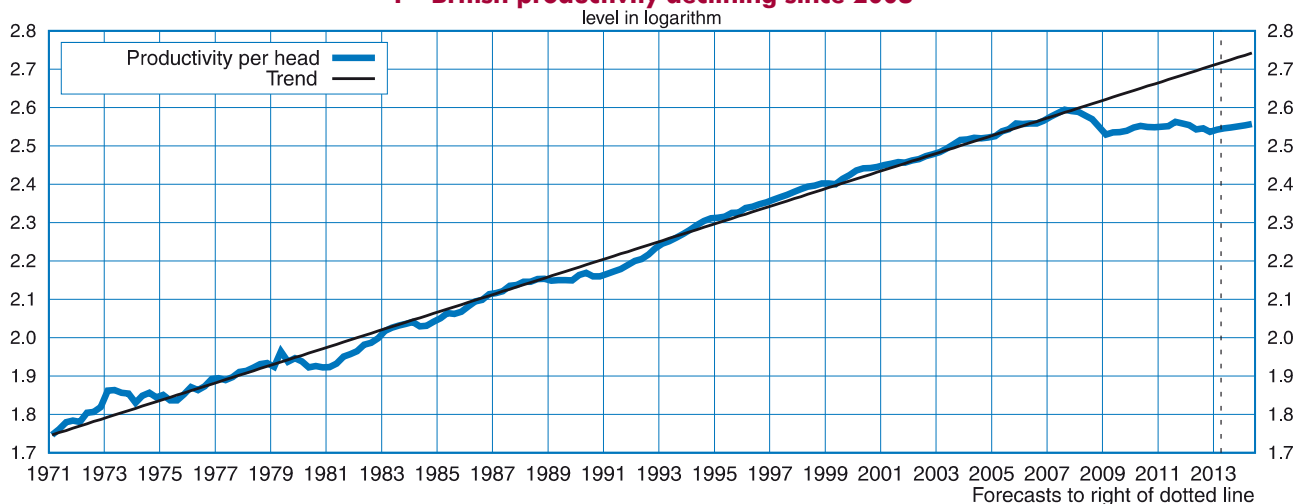
The British economy registered significant labor productivity gains (increase in output per employee or per hour worked) for several decades: from 1971 to 2007, productivity rose by around 2.4% per year. This rate was particularly sustained in comparison to the other developed economies. The trend was relatively linear from 1971 to 2007 (see Graph 1), so much so that estimates of the productivity trend were barely dependent on the sub-period selected.

From Q4 2007 to Q1 2009, labor productivity fell by 6% and, despite the pick-up in activity, it has stagnated ever since (+0.4% per year on average). At present British productivity is therefore 4% lower than its pre-crisis level, and 16% down on its pre-crisis trend.

### A sharper fall than elsewhere in Europe

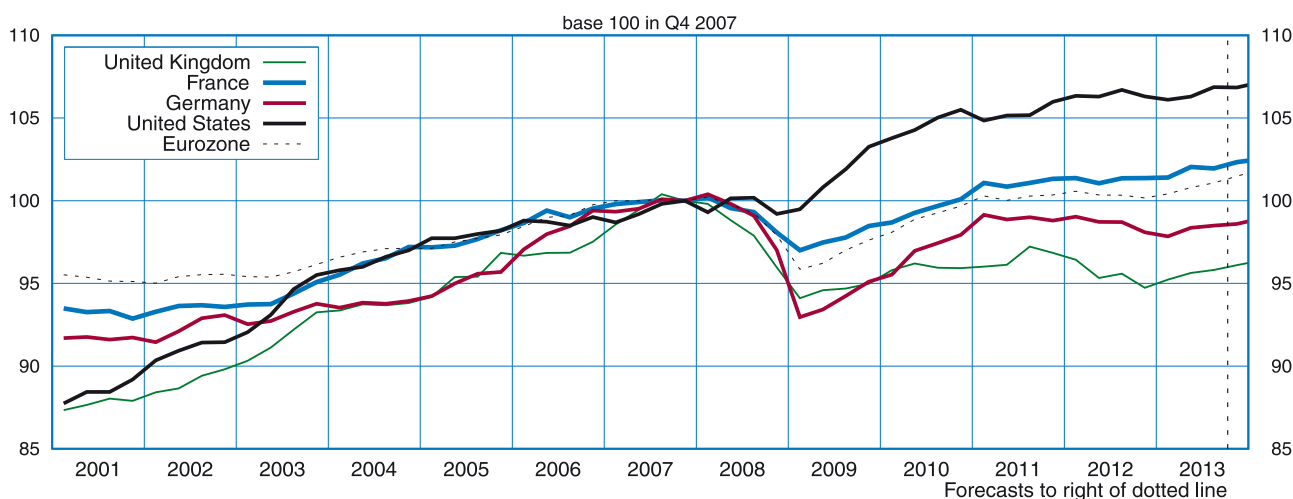
Productivity is sluggish in numerous European countries. For example, in France (respectively in Germany) productivity is 2% higher (respectively 1.5% lower) than its pre-crisis level (see Graph 2). As the United Kingdom's pre-crisis productivity gains were far more dynamic than in France and in Germany, the scale of the differential with the trend is greater (16% against 8% in Germany and 6% in France).

**1 - British productivity declining since 2008**



Sources: ONS, INSEE calculations

**2 - International comparison of productivities**



Sources: National Statistical Institutes

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### *Tepid recovery of activity...*

Growth in activity has been particularly weak over the last five years, particularly in comparison with the post-crisis periods after 1973, 1980 and 1990. Following previous recessions the British economy managed to return to its pre-recession level in one, two and three years respectively after 1990, 1980 and 1973. In Q2 2013, five years after the 2008 recession, GDP was still 3.3% below its level of Q1 2008. Although the accounts for the last three years are still not finalised and may therefore be revised, the hypothesis that the drop in productivity could mainly be explained by measurement errors appears unlikely given the scale of the phenomenon (see Box 1).

### *... while employment has been strong*

In parallel, employment has picked up rapidly (see Graph 3). After falling by 2.4% in the space of two years, employment recovered in two successive dynamic phases, one in early 2010 and the other in 2011. Employment is now almost 1.5% higher than its pre-crisis peak. The downward trend in productivity is thus the conjunction of modest growth and a surprisingly sharp rise in employment.

### *The classic phenomenon of job retention...*

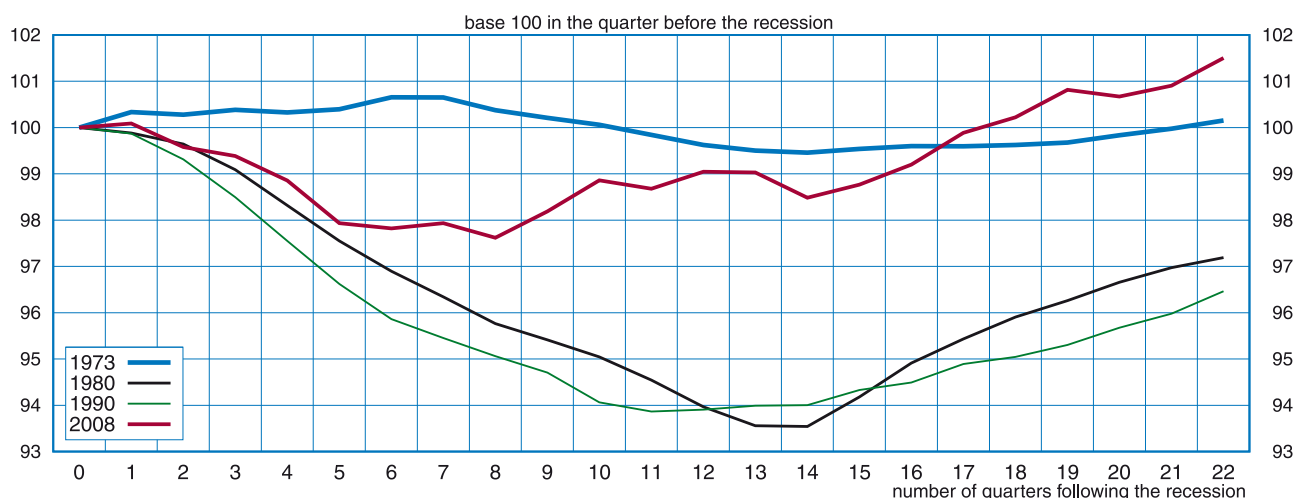
Classically, a decline in productivity can be explained by the "productivity cycle": around a stable trend, productivity slips back during the crisis phase (because employers hold on to their employees) and then picks up strongly during the recovery phase (as businesses use their spare capacities to meet demand before hiring again). In the short term the costs of hiring and laying off, along with the learning effects, encourage businesses to smooth the effects of demand shocks on their labour supply.

### *... does not explain the scale of the productivity puzzle*

Yet this does not explain the current British situation. Firstly, job retention is a short-term phenomenon and it seems unlikely that company chiefs have still not adjusted their workforce five years after the recession. During previous recessions, labor productivity returned to its pre-crisis trend after four years. According to econometric modelling, the total productivity cycle measured by the differential between the short-term simulation and the long-term target is around 3 points in Q2 2013 (see Box 2).

Additionally, the layoff rate has not been particularly low since the crisis: the dynamism of employment seems to have come from strong hiring trends rather than a low level of layoffs. Hence the job retention argument does not explain the dynamic hiring trends.

### 3 - Recovery of employment after different recessions



Sources: ONS, INSEE calculations

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## Box 1 - Measurement difficulties can only marginally explain the productivity puzzle.

As in France, British GDP as calculated by the Office for National Statistics (ONS) is based on methodological assumptions. Additionally, data posterior to 2010 are not yet definitive and are thus subject to potential revisions. However, any underestimation of GDP could only, a priori, provide a very partial explanation of the British productivity puzzle because between 1993 and 2009, the average annual revision of GDP was just 0.6%.

### Probable influence of the difficulty measuring banking sector value-added

In 2012 the banking sector represented roughly 8% of value-added in the United Kingdom and employed over 1.1 million people. In the national accounts the value-added of the banking sector is mainly recorded as a Financial Intermediation Service Indirectly Measured (FISIM). FISIM and the volume-price breakdown are calculated as follows:

$$FISIM_t = \frac{M_t}{P_t} (i_t - i_t^{riskless}) P_t$$

volume    deflator

with  $M_t$ , the total amount of loans granted,

$P_t$ , the prices of GDP in  $t$ ,

$i_t$ , the average interest rate on loans granted,

$i_t^{riskless}$ , the riskless interest rate in the economy.

Hence the value-added of the financial sector in volume contributes very positively to real GDP growth during the formation of a property bubble and very negatively when it bursts (Oulton, 2013). Additionally, Haldane et al. (2010) observe that the use of an interest rate, which is not adjusted for lending-related risks, leads to a rise in real production as the risks taken by banks increase.

Lastly, a third cause of possible misalignment stems from the data. The British banking sector's production is derived from the accounts of banks, which include capital transactions that should not feature in GDP. It appears that the data from the statistical collection by the Bank of England may have resulted in the erroneous inclusion of certain capital transactions in the production of the financial sector in the 2000s (Weale, 2009).

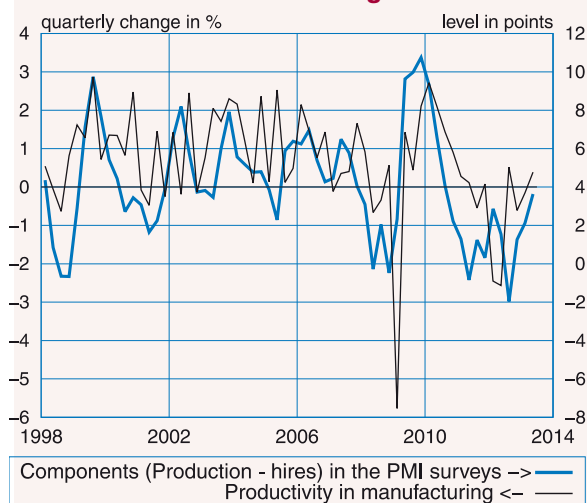
### The non-inclusion of intangible investments may also explain part of the puzzle

Apart from patents and software, intangible investments are not currently included in corporate investment. These intangible investments have grown strongly since 2008 after a relatively sluggish period from the start of the 2000s, according to Goodridge et al. (2013). Their inclusion would thus diminish GDP prior to 2008 and increase it since that date: Goodridge argues that this non-inclusion would explain 5 of the 16-point loss in productivity against its long-term trend. This effect has not been highlighted for R&D: according to Eurostat, the R&D rate was extremely stable in the United Kingdom from 1996 to 2011, at around 1.8% of GDP.

### Even though surveys have captured the productivity drop well

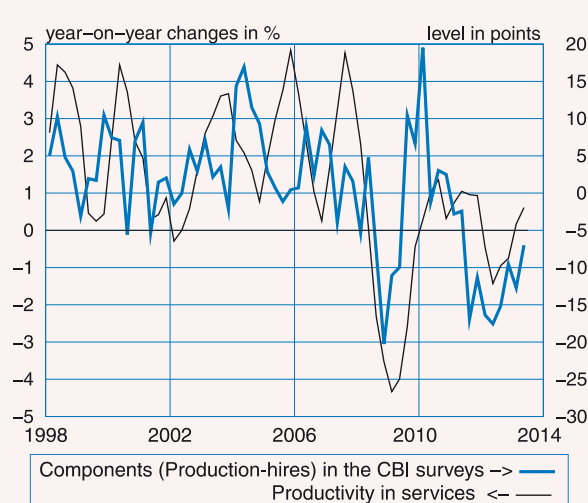
Despite these potential measurement errors, their real contribution as an explanation of the productivity puzzle is probably modest. The slump in productivity has been faithfully tracked by the business tendency surveys, which have been barely revised and which are built orthogonally with the National Accounts: the "employment" components of the surveys (CBI and Markit's PMI, in both manufacturing and services) have been at exceptionally high levels relative to the "activity" components since 2008 (see Graphs 1 and 2). ■

1 - Productivity and Markit surveys  
Manufacturing



Sources: Markit, ONS, INSEE calculations

2 - Productivity and CBI surveys  
Services



Sources: CBI, ONS, INSEE calculations

## Box 2 - Modelling employment in the United Kingdom

### A simple model accounted for employment growth until mid-2009

Up until the crisis, the linear trend of productivity gains in the British economy meant that employment growth could be modelled simply with an error-correction model using only GDP, a trend and any lags in employment and activity (see Table 1).

However, while the model correctly accounts for job destructions until mid-2009, it does not explain the recovery of employment since then (see Graph). In mid-2013, the gap between the simulated and observed figures reached 14.6%. Nonetheless, this model can be used to get a first estimate of the productivity cycle. The gap between the long-term target and the simulated figure thus gives an approximation of the contribution by the productivity cycle to recent growth in employment. In Q2 2013, this gap was about 3 points.

### Around two-thirds of the productivity gap can be explained

Among the various explanations put forward in this report, some cannot be integrated into the model due to a lack of long-term data or clearly identifiable variables: this is notably the case of the bad allocation of capital argument. To capture the other arguments advanced, several explanatory variables have been added to the equation: real value-added in the mining and financial sectors, the labour force participation rate, the part-time work rate, and manufacturing capacity measured against industrial output and the capacity utilisation rate. Given the small number of observations, the Johansen test on the number of cointegration relationships is not conclusive. *Ericsson and MacKinnon* test statistics show the existence of at least one cointegration relationship (at the 1% threshold) but the level of the variable coefficients cannot be interpreted easily because the model potentially estimates a linear combination of several cointegration relationships (see Table 2). In all, this model estimated over the period 1990-2007 brings down the unexplained productivity gap in Q2 2013 to around 6.5% (see Graph). ■

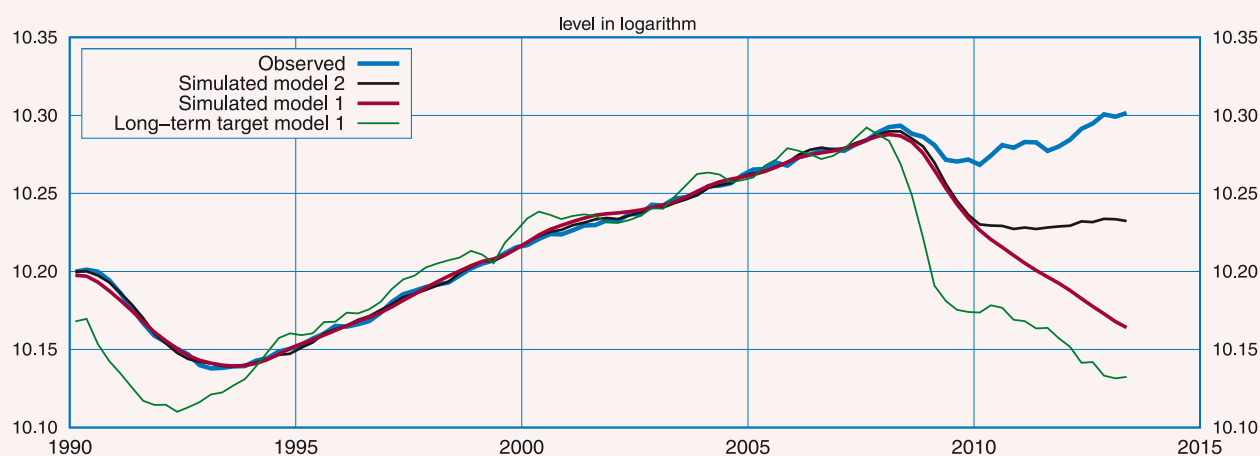
Table 1

### Explained variable: quarterly change (qc) employment in %

Estimation period: 1990 Q1-2007 Q4		
	estimated coefficients	T Student
Constant	-0.1736	-5.70
Employment (-1)	-0.1149	-5.50*
GDP (-1)	0.1149	5.50
Trend (-1)	-0.0007	
qc of GDP (in %)	0.1379	2.80
qc of employment (-2) (in %)	0.2200	2.40
		* Threshold cointegration test value <i>Ericsson MacKinnon</i> (2002) à 5% : -3,8
Adjusted R <sup>2</sup> = 0,70 RMSE = 0,20 points		

Source: INSEE calculations

### Observed and simulated employment according the two models Estimated models 1990-2007



Sources: CBI, ONS, INSEE calculations

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Table 2

Explained variable: quarterly change (qc) employment in %

Estimation period: 1990 Q1-2007 Q4		
	estimated coefficients	T Student
Constant	-0.4042	-3.84
Employment (-1)	-0.1787	-5.36*
GDP (-1)	0.1787	5.36
Manufacturing capacity (-1)	-0.0068	
Trend (-1)	-0.0007	
VA Finance and Insurance(-1)	-0.0263	
VA Extractive industries (-1)	-0.0075	
Activity rate (-1)	0.2968	
Part-time rate (-1)	0.0639	
qc of activity rate (in point)	1.0926	5.41
qc of GDP (in %)	0.1155	2.31
qc of Part-time rate (in point)	-0.2202	-1.42

\* Threshold cointegration test value  
Ericsson MacKinnon (2002) à 5% : -4,6

Adjusted R<sup>2</sup> = 0,79 RMSE = 0,17 points

Source: INSEE calculations

### Low degree of smoothing through hours worked

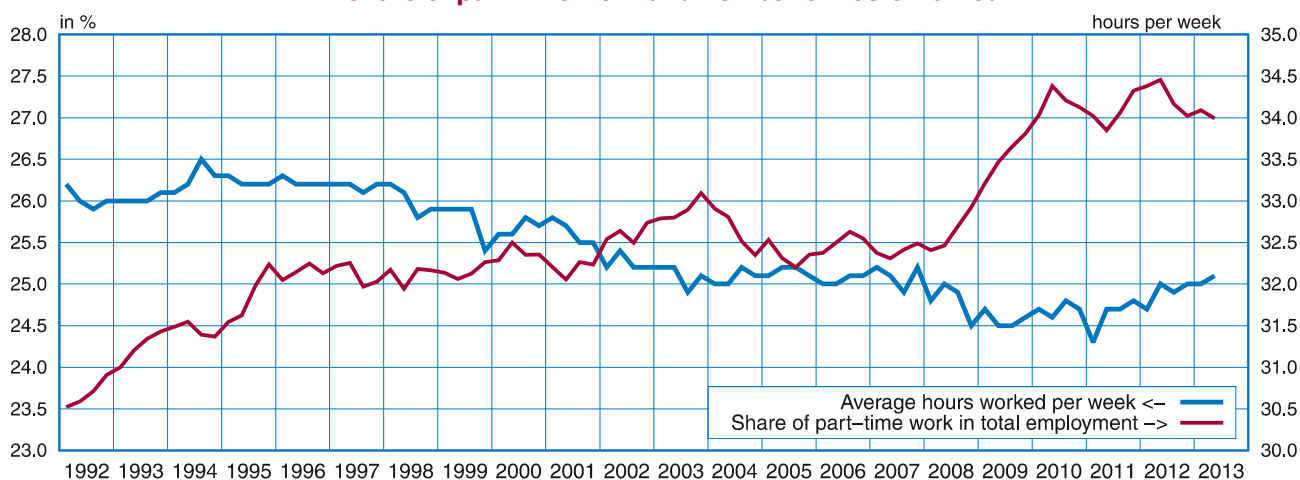
Traditionally, part of the drop in productivity during a crisis phase stems from a fall in working time per capita: businesses prefer to reduce their employees' working time (short-time work, reduced overtime) rather than laying off.

The share of part-time employees rose from 25.5% to around 27.0% of total employment between 2008 and 2012 (see Graph 4). However, the average number of hours worked per person has now returned to its pre-crisis level (approximately 32 hours a week) despite the growth in part-time jobs. Indeed the working time of both full-time and part-time workers has risen sharply since 2008.

### Productivity per hour worked following a parallel trend to that of per capita productivity

Productivity per hour worked has therefore fallen back sharply since the 2008 crisis. Over the period from 1993 to 2007, productivity per hour worked increased at a rate of +2.6% per year on average (+2.4% for per capita productivity). Since the crisis, its growth rate has been virtually nil.

#### 4 - Share of part-time work and number of hours worked



Source: ONS



Despite this, these part-time work contracts could lead to weaker productivity caused by the issues of unlearning, training needs, or lower motivation levels. So the growth in the number of these contracts might explain part of the drop in per capita productivity, not because of a quantitative drop in the number of hours worked but because the hourly productivity of part-time workers may be lower. But this effect - if it exists - is likely marginal: as the increase in the share of these part-time contracts has been only 1.5 points since the start of the crisis, even assuming a productivity reduced by half, it would only explain 0.9 points of the lower level of productivity.

*The rise in the proportion of self-employed people predates the crisis*

Another explanation often cited is the sharp rise in self-employment in the United Kingdom since the crisis (see *Dezeure and Sobaihi, 2012*). It is true that the creation of self-employed jobs has been particularly dynamic, most notably from mid-2011 to mid-2012 (between June 2011 and June 2012 the British economy created 253,000 self-employed jobs, or 60% of jobs created over the period) with the government programme New Enterprise Allowance, the aim of which was to help unemployed people create their own job. However, while this factor may explain part of the fall in productivity over this period, it does not appear to account for the halt in productivity since 2008. The share of self-employment has risen regularly since 2000 (from 11.8% in 2000 to 13.0% in 2007 and 14.0% in 2013) but this did not result in a significant slowdown in productivity before 2007.<sup>1</sup>

### A particularly marked slump in productivity in the extractive industry and the financial sector

*Sectoral heterogeneity may have a twofold effect on productivity*

In terms of sector, two distinct effects have taken their toll on total productivity: productivity in each individual sector and the reallocation of labour between sectors. In concrete terms a negative shock on productivity can be explained both by the drop in productivity within certain sectors and by a reallocation of labour towards activities with a low level of productivity.

*However, sector-to-sector reallocation has marginal effects on productivity*

Sector-to-sector reallocation has not contributed to the halt in productivity since the end of 2007. Its contribution has actually been very slightly positive (+0.1% of annual growth). Indeed, employment has been very dynamic in non-manufacturing industry (+21% between 2007 and 2012) where per capita productivity is particularly high, and has declined in construction where per capita productivity is below average. Employment has also contracted in financial services, a sector with a high level of productivity. All in all, employment trends between sectors with high and low productivity have cancelled each other out.

*The slowdown in productivity is particularly sharp in the extractive industry and the financial sector*

Since the crisis, productivity has slowed sharply in all nine sectors (see *Graph 5*). It has even fallen in most of them (with construction and manufacturing the only exceptions). The slowdown has been particularly marked in the extractive industry and in financial services, both of which experienced strong growth prior to the 2008 crisis and had successively sustained growth in productivity since the 1990s.

*The extractive industry boosted productivity up to 1999*

The British extractive industry has suffered from dwindling oil reserves in the North Sea<sup>2</sup> since the end of the 1990s. The quantities extracted have diminished but the labour force required at production units is incompressible and has even risen due to the increase in maintenance work. So productivity has fallen quite sharply since 1999. In non-manufacturing industry as a whole productivity gains reached a figure of 7.7% on average in the 1990s. From 1999 to 2007 these productivity gains disappeared (see *Table 1*). Since the crisis the rapid exhaustion of oil resources in the North Sea has led to a slump in productivity (-8.6% per year on average since 2009).

(1) Furthermore, as with part-time work, even assuming a productivity reduced by half among the self-employed, the rise from 13% to 14% of their share in employment would only explain 0.5 points of the overall drop in productivity.

(2) See "In the UK, black gold no longer flowing so freely", *Conjoncture in France*, June 2012.

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### *The financial sector took over until 2007*

Value-added in the financial sector soared between 2000 and 2007 (+55% from Q1 2000 to Q4 2007), partly due to the property bubble (see Box 1) and partly linked with the sharp rise in exports of financial services: between 2000 and 2007 the share of financial services in British exports rose from 6.3% to 12.5%. The financial and property crisis brought a sharp drop in household and foreign demand: the sector's value-added collapsed (-15% from Q4 2008 to Q2 2013). After recording productivity gains of 5.4% per year on average between 1999 and 2007, productivity in the sector has declined since the crisis.

The extractive industry no longer sustained British productivity after 1999 but new productivity gains were provided by the financial sector. This support was interrupted in 2008 and productivity in the extractive industry collapsed because of the exhaustion of resources. Productivity gains increased by around 0.4 points per year from 1990 to 2007 thanks to the successive dynamics of these two atypical sectors. Conversely, they have fallen by around 0.4 points per year since the crisis for the same reasons.

### *The decline in extractive and financial industries explained 4 points of the productivity puzzle*

To conclude, the inclusion of the highly specific non-manufacturing and financial services sectors should explain approximately 4 negative points registered on the British productivity puzzle since the beginning of the crisis. But productivity has nonetheless fallen in the rest of the British economy - which was dynamic before the crisis, in particular in service sectors such as distribution or transport (see Graph 6).

## 5 - Sectoral contributions to annual productivity gains

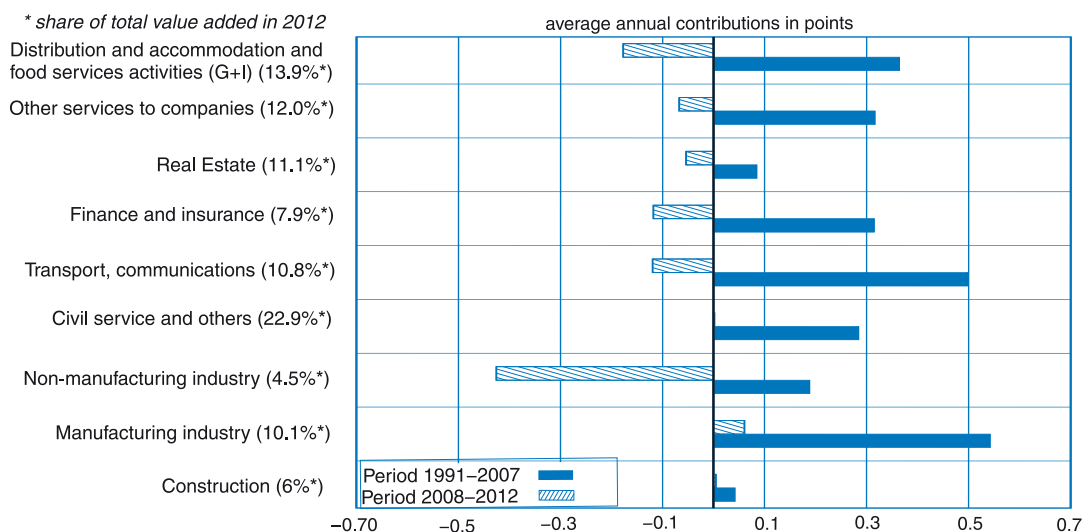


Table 1

### Growth in average annual productivity

in %

	1990-1999	1999-2007	2007-2009	2009-2012
Whole economy (1)	3.0	2.0	-2.6	0.4
including :				
Non-manufacturing industry	7.7	-0.4	-9.3	-8.6
Financial and insurance sector	3.7	5.4	-1.5	-0.4
Rest of economy (2)	2.6	1.7	-2.2	0.8
(1)-(2)	0.4	0.4	-0.4	-0.4

Sources : ONS, INSEE calculations



# In search of lost British productivity

## Under-investment has contributed to weaker productivity

*A sluggish corporate investment since 2000...*

The British corporate investment rate has declined markedly since the early 2000s. Standing at roughly 12% of GDP in the 1990s, it slid continuously from 2000 to 2005, settling at 8.4% on average between 2005 and 2013 (see Graph 7). Between 2000 and 2007, this decline did not lead to a drop in the overall investment rate as the property market boom offset the slide in productive investment. However, the bursting of the property bubble in 2008 brought with it a 4-point drop in the overall investment rate (from 18% to 14% of GDP).

*...especially in industry.*

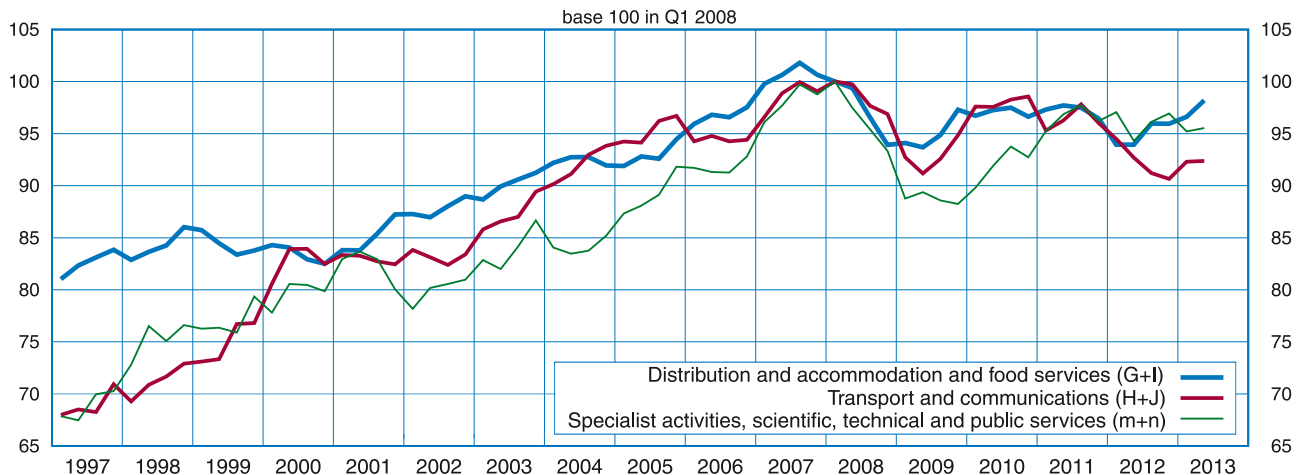
The fall has been sharpest in investment in capital goods, which has represented a mere 5.5% of GDP since 2009 against 8.6% on average in the 1990s. While it grew vigorously from the start of the 1980s, the manufacturing capacity of the British economy (calculated<sup>3</sup> as the ratio between manufacturing output and the production capacity utilisation rate) has fallen back by around 10% since 2000 (see Graph 8).

*... impacts to productivity about 3 points...*

The scale of the loss of this under-investment in terms of capital stock can be valued at 12% of total corporate capital stock (see Box 3). In all, under-investment by British enterprises since 2000 thus explains 2.8 points of the productivity puzzle.

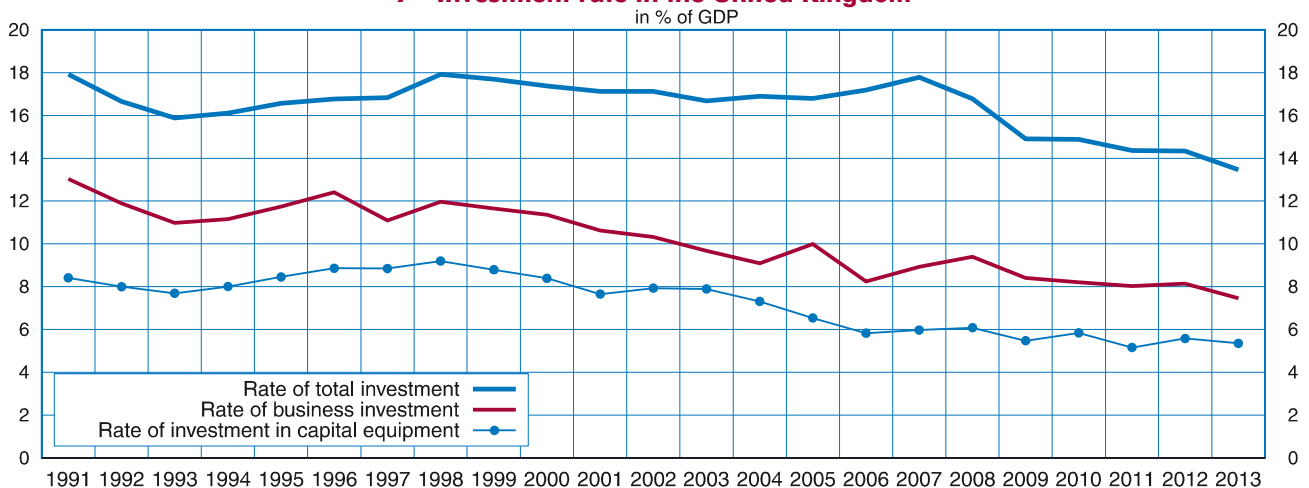
(3) This measure gives an imperfect estimate of manufacturing capacity because the measure of the production capacity utilisation rate is subject to uncertainties in surveys.

## 6 - Productivity in the services sector



Sources: ONS, INSEE calculations

## 7 - Investment rate in the United Kingdom



How to read it: average of the first half of 2013

Source: ONS

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... this impact which should ease in the future

Lower investment explains both the productivity level shock and the slowdown in productivity gains. However, there are several indications that British enterprises, particularly industrial companies, have started to develop their production capacities once again. The CBI Investment Intentions Survey correctly tracks the under-investment of the 2000s, with a clearly negative response balance over this period (see Graph 9). But the balance has picked up sharply since 2010, suggesting that manufacturing capacity may grow once more.

### Supply shock on the labour market and spectacular adjustment of wages

A supply shock on the labour market...

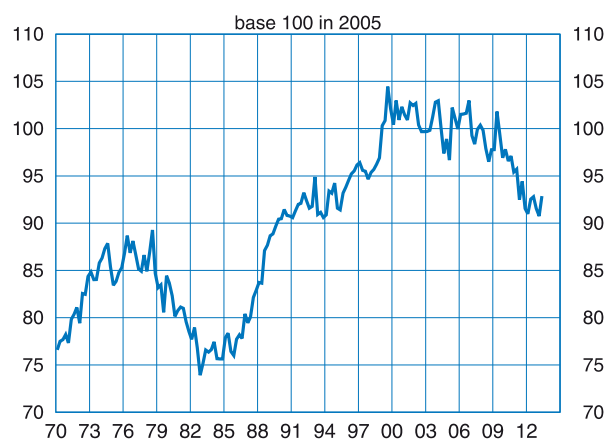
Following the 2008 crisis the labour force participation rate fell by about 0.7 points: "discouraged worker" effects are traditionally strong in the United Kingdom. However, the labour force participation rate has been on the rise once again since mid-2011, even though the unemployment rate has remained stable at around 8% (see Graph 10). This participation rate is therefore now at a particularly high level (77.7% of the working-age population in Q2 2013). However, this effect can only explain 0.8 points at most of the drop in productivity<sup>4</sup>.

... linked with changes in legislation

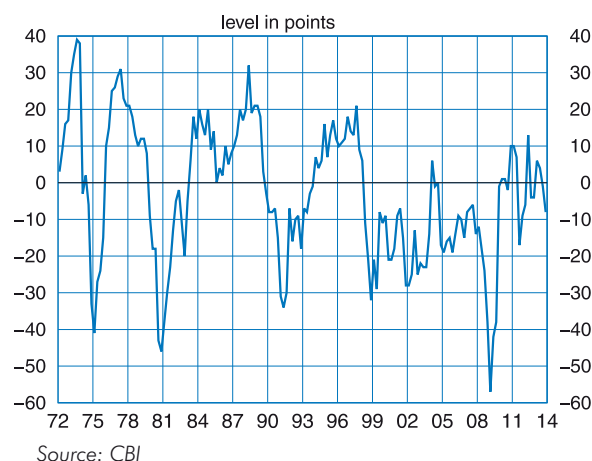
This labour supply shock is directly tied to changes in the legislation. The 2007 pension reform provides for a gradual rise in the full pension retirement age (from 60 in 2010 to 65 in 2020 for women). Additionally, in 2010 the government abolished the option for companies to enforce automatic retirement once their employees reached 65. These measures have led to an increase in the average retirement age (62 in 2000, 64 in 2013), and hence a rise in labour force participation among people aged over 60. Furthermore, the eligibility conditions for welfare income have been considerably tightened in terms of job-seeking obligations: the minimum child's age at which single parents are required to seek a job was progressively reduced from 16 to 5 between 2008 and 2012. The labour force participation rate has risen significantly (+10 points for single parents of children aged between 7 and 11). Lastly, the 2012 Welfare Reform Act once again tightened the job-seeking conditions for the awarding of unemployment benefit.

(4) The labour force participation rate rose from about 76.5% in Q1 2010 to 77.7% in Q2 2013, while the unemployment rate was stable between these two periods. Assuming that new entrants are half as productive as the others and normalising to one the productivity prior to the labour supply shock, productivity falls from 1 to  $77.1/77.7$ , a drop of 0.8 point.

**8 - Manufacturing capacity (manufacturing output/capacity utilisation rate)**



**9 - Survey of investment intentions in the industry**

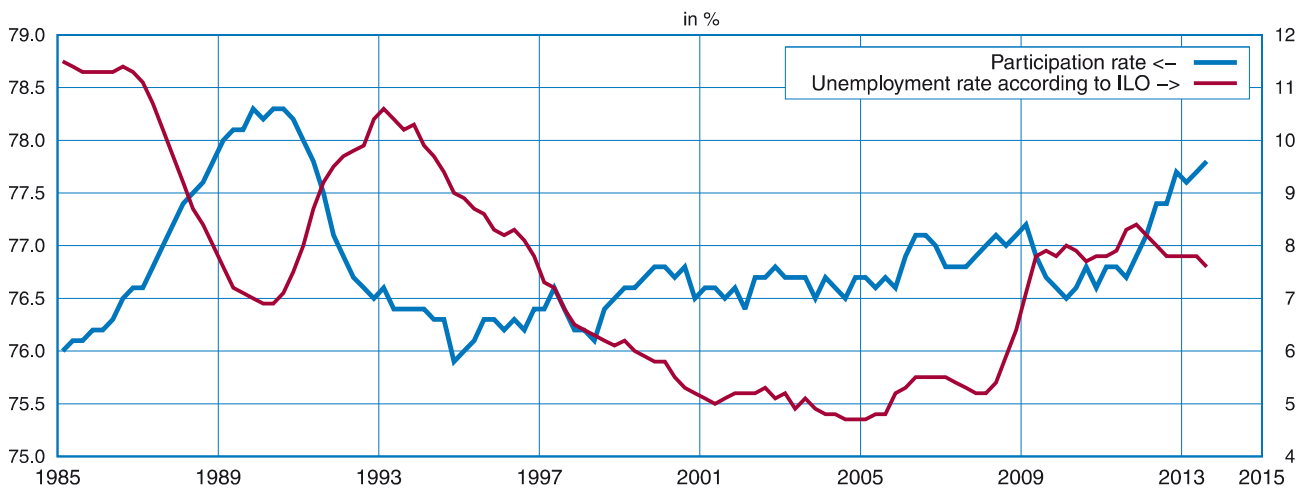


## Massive adjustment on real wages

7% decline in real wages...

The inertia of productivity has not led to a drop in the corporate margin rate, which is now close to that of 2007. The real wages of British employees have fallen by almost 7% in five years: the adjustment of the labour market to the productivity puzzle has been extremely swift and radical. This situation is very different to that observed in France, Germany and the United States, where real wages have actually progressed over the same period (between +2.4% and 5.0%, see Graph 11).

10 - Activity rates and unemployment rates in United Kingdom



Source: ONS

### Box 3 - Calculations of the productivity loss linked to labour supply and to capital stock

If the economy is represented by means of a Cobb-Douglas production function:

$$VA = K^\alpha * L^{1-\alpha}$$

with  $\alpha$  representing the share of capital remuneration in GDP, that is, roughly 1/3.

Then the apparent labour productivity is written:

$$PDT = \frac{VA}{L} = \left(\frac{K}{L}\right)^{\frac{1}{3}}$$

And the rate of variation in productivity is:

$$\frac{\dot{P}dt}{Pdt} = \frac{1}{3} * \frac{\dot{K}}{K} - \frac{1}{3} * \frac{\dot{L}}{L}$$

For capital stock, we restrict ourselves to the analysis of only the value-added of enterprises, which represents 2/3 of GDP in 2012. The ONS provides series of capital stocks and value-added for companies since 1990. The trend differential with capital stock is defined as:

$$K_T^{trend} - K_T^{observed} = \sum_{t=T-\frac{1}{\delta}}^T (s_t - \bar{s})(1 - (T-t)\delta)VA_t$$

where

$s_t = \frac{Inv_t}{VA_t}$  represents the investment rate in year t,

$\bar{s}$  represents the mean investment rate between 1990 and 2005 and  $\delta$  the derating factor evaluated at 5%.<sup>1</sup>

Underinvestment since the early 2000s would thus lead to a loss in the order of 12.4% on the capital stock of enterprises. The contribution of this factor to the drop in productivity would be -2.8 points:

$$\frac{\dot{P}dt}{Pdt} = \frac{1}{3} * \frac{2}{3} * (-12,4) = -2,8 \text{ points} \blacksquare$$

(1) The results are not very sensitive to this parameter. With a rate of 10% instead of 5%, the contribution of underinvestment to the productivity puzzle falls from exactly -2.8 points to -2.1 points.

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*...both cause and consequence of the productivity puzzle*

This reduction would be partially understandable, on one hand by the weakening of the employees' bargaining power in line with activity rate increase, and on the other hand by the underinvestment which decreased the capital per employee. The effect of wages on employment is difficult to determine because the causality is twofold: while a drop in the cost of labour naturally favours employment, any fall in productivity - due to a technology shock, for example - ultimately results in lower wages. As regards the underinvestment, this one being clearly previous to the backward movement of salaries, the causality direction seems nevertheless strong. In models integrating a productivity-wages-employment loop, an exogenous drop in wages of 1% results in a rise in employment of roughly 0.5%. This is the case with France in the Mésange model and with The United Kingdom in the Nigem global model. In the United Kingdom the average wage per head as a ratio of the price of GDP has decline by approximately 14% from its pre-crisis trend, which is a maximum theoretical contribution in the order of 7 points.

### Bad reallocation of capital

*The low level of renewal of the productive fabric...*

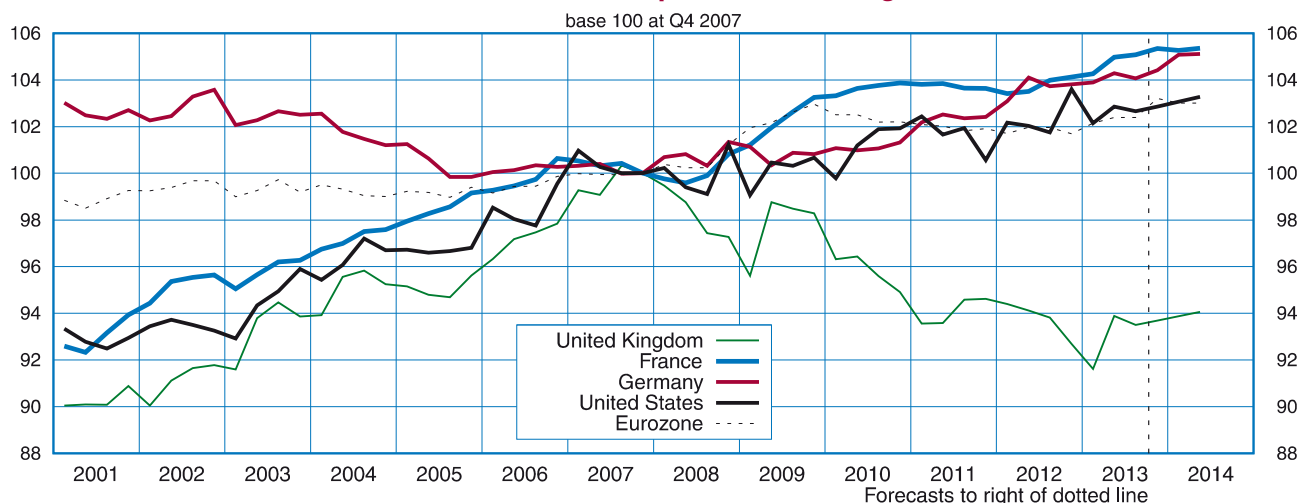
British productivity appears to have been temporarily weakened by a bad allocation of capital since the recession, according to Broadbent (2012, 2013). The difficulties encountered by British banks may have led to an unwillingness to finance company start-ups while, conversely, certain low-productivity companies have continued to receive financing. The financial system would appear not to have perceived credit risk correctly. A first indication of this error of assessment is the relatively weak rates of company creation and failure since the crisis (see Graph 12).

*... which would indicate increasing dispersion of return on capital between sectors...*

Additionally, the dispersion of output rates between sectors has increased since the crisis, according to Broadbent (2012, 2013). With perfect capital mobility, these rates should only reveal credit risks because the capital would tend to be rapidly reallocated to the high-output sectors. In other words, the dispersion of output rates indicates that capital is not being reallocated properly. However, as the aggregate-level (15 sectors) output rates used by Broadbent (2012, 2013) are highly dispersed<sup>5</sup>, the author calculates the dispersion of standardised output rates. The ability to evidence the rise in dispersion depends very strongly on the reference period in which the author considers that capital is allocated correctly (2000-2007). In particular, the increase in dispersion cannot be evidenced

(5) On a gross basis, two sectors have continuously presented negative returns on capital for the last 15 years.

### 11 - International comparison of real wages



Source: National Statistical Institutes, INSEE calculations

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directly with non-standard data. However, the details show a rise in the output rates in manufacturing and a fall in the construction and property sectors, a sign that capital has not been successfully reallocated from the latter to the former.

... could cause a productivity loss evaluated at 3 to 4 points

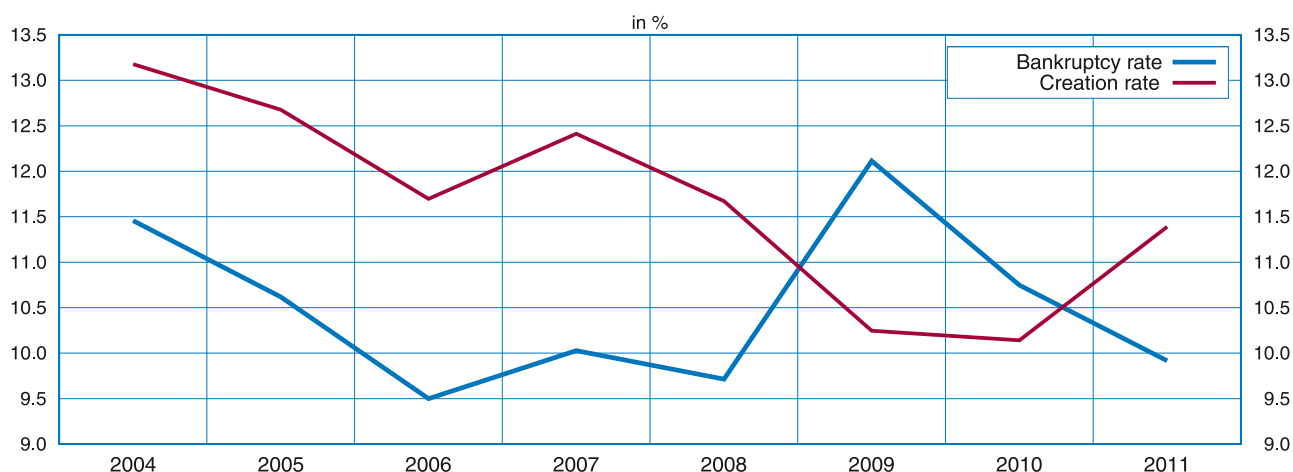
At macroeconomic level, according to the ONS (*Field and Franklin, 2013*) the dispersion of labour productivity also increased sharply between firms within the same sector between 2006 and 2010. According to the Bank of England (see *Broadbent, 2013*), the overall loss of productivity due to this incorrect allocation of capital is evaluated at 3 to 4 points. This effect is largely temporary: once the usual financing channels have been restored, reallocations should resume and the loss caused by the bad reallocation should gradually disappear, and hence productivity should increase faster than its potential for a few periods. Hysteresis effects are nonetheless likely to emerge if the reallocations are slow to come, as the business start-ups currently put on hold will ultimately never take place.

### Conclusion: the puzzle has mainly been a loss in level

The British economy had enjoyed regular, stable growth in productivity since the Second World War, but this collapsed in 2008 and has not recovered since; it is now approximately 16% below its pre-crisis trend. Although the effects are not absolutely summable, the various explanations cited in the literature and examined here account for between half and three-quarters of the shock (see *Table 2*). Alternatively, the effects of the productivity cycle variables - under-investment, labour supply shock, and specifics of the financial and oil sectors - have been identified in an employment equation estimated over the period 1990-2007. Together they explain roughly 2/3 of the British productivity puzzle between 2008 and 2013.

The nature of the shocks points to a sense that British productivity should enjoy restored dynamism in the coming years: with an improvement in activity, the decline ascribable to the productivity cycle (3 points) should narrow and even be reversed in the medium term as the economic recovery gathers pace. Additionally, under-investment for innovative firms and the rise in the labour force participation rate are unlikely to continue indefinitely, while investment is showing signs of picking up again in industry, thus enabling the return of productivity gains even though the loss in level is unlikely to be offset. Overall, only the specific features of the support from the oil and financial sectors have led to both a 4-point fall in level and a slowdown in productivity gains in the order of 0.4% per year. ■

### 12 - Creation rate and bankruptcy



Source: ONS

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Table 2

### Results synthesis

	Partial estimates (not summable)	Econometric estimation on one step	Bibliographic references
Deviation from the long-term trend		16 %	
Productivity cycle		≈ 3 points	1,2 points financial sector only (Disney et al., 2013)
End of support and financial sectors of the extractive industry	≈ 4 points	≈ 7,5 points	3 points (FMI, 2013)
Adjustment of real wages per capita	< 7 points		4-5 points (Daly et al., 2013)
including under-investment	≈ 3 points		
including increase in part-time	< 1 points		
including increase the activity rate	< 1 points		
Increase self-employed	< 1 points		between 0.2 and 0.5 points (Disney et al., 2013)
Bad allocation of capital and underfunding			between 3 and 4 points (Broadbent, 2013)
Measurement errors	Excluding financial services marginal		5 points (Goodridge et al., 2013) 4 points (Daly, 2012)

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