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Data analysis | Economic regulation | Competition law

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Gas distribution price control review: Update of analysis of productivity improvement trends

Reckon LLP, limited liability partnership registered in England (number OC307897)
20 Theobald's Road, London, WC1X 8PF • Telephone 020 7841 5850 • www.reckon.co.uk

1 SUMMARY

Background

1.1 Ofgem's approach to estimating operating expenditure requirements for the determination of the 2008–2013 price control for the gas distribution networks in Great Britain is based on assumptions about future rates of change in operating expenditure. These assumptions are obtained by combining a "frontier shift" trend of change over time, applicable to all companies, with a "catch-up" element, which varies from company to company.

1.2 In its initial proposals,[1] Ofgem used a frontier shift productivity trend of 2.5 per cent a year (including 1.1 per cent a year attributed to a comparative competition effect), combined with input price trends averaging 0.9 per cent a year above RPI inflation.

1.3 Ofgem took account of two consultancy reports in setting these assumptions: a report by Europe Economics for Ofgem,[2] and a report by First Economics for the gas distribution network operators.[3]

Purpose and structure of this report

1.4 This report provides evidence for the determination of the industry-wide trend, which complements the evidence in Europe Economics (2007) and First Economics (2007).

1.5 Ofgem asked us to review First Economics (2007), and to update the analysis of productivity trends in Europe Economics (2007) so as to take account of the criticisms made by First Economics and to use more recent data sources.

1.6 The report is structured as follows.

1.7 This section highlights the main conclusions and implications of our work. Section 2 reviews First Economics (2007) submitted to Ofgem by the gas distribution network operators. Section 3 sets out the main results from our productivity trend analysis for all sectors, and reviews some features of the productivity data for the sectors chosen as comparators for gas distribution operating expenditure.

1.8 Section 4 provides additional data, including a comparison of our results with those obtained from the older dataset used by Europe Economics, details of our data sources, the definition of the measures of productivity that we have calculated, and the methods used to process the data. This section is technical and not directly drawn upon in the other parts of the report. It is included to enable readers to understand our methods and assumptions and reproduce our results.

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[1] Ofgem (2007) *Gas Distribution Price Control Review Initial Proposals Document*, links at http://www.reckon.co.uk/item/38048f97

[2] Europe Economics (2007) *Top down benchmarking of UK Gas Distribution Network Operators*, published by Ofgem, http://go.reckon.co.uk/s70701 (PDF)

[3] First Economics (2007) *The 2007 Gas Distribution Price Control Review: A Top-down Analysis of the Scope for Real Terms Cost Reductions*, published by Ofgem as part of National Grid's consultation response, http://go.reckon.co.uk/s87325 (PDF)

Implications from First Economics (2007)

1.9 First Economics (2007) provides an analysis of trends in consumer prices for different types of goods and services. According to First Economics, this shows that:

a) The significant role of imports in driving reduction of goods prices has disconnected the trend in the all-items RPI from the costs borne by efficient gas network distribution companies, thereby invalidating the approach used by Europe Economics to link operating expenditure trends to comparator industry productivity improvement net of whole-economy productivity improvement.

b) The observed trends in consumer prices point towards increases in operating expenditure faster than the RPI, even after taking account of capital substitution and of an assumed comparative competition effect of 1.1 per cent a year.

1.10 We review these arguments in Section 2.

1.11 In summary, we agree with the first contention summarised above, but we do not think that the consumer price data provide a reliable alternative source of evidence for gas distribution network operating expenditure trends.

1.12 In our view, the data presented in First Economics (2007) would not be sufficiently relevant to refute a below-RPI trend for operating expenditure derived from a corrected analysis of productivity and input price trends.

Implications from Europe Economics (2007)

1.13 The productivity result highlighted in Europe Economics (2007) (Table 4.6) is a figure of 0.6 per cent a year labelled "Bench mark TFP out performance".

1.14 This is obtained by the following procedure:

a) Select a set of comparator sectors and weights based on inspection of the nature of work of the gas distribution network businesses.

b) Take TFP growth estimates from the NISEC02 dataset for each year in the period 1973–1999 for each comparator sector. TFP stands for labour and materials multifactor productivity using a value added concept as the measure of output.

c) Calculate average rates of TFP growth in the comparator sectors, using a regression procedure to eliminate effects attributable to privatisation.

d) Calculate a weighted-average of the TFP results for the comparator sectors.

1.15 Europe Economics' business services adjustment is a way of rebalancing the weights to take account of assumptions about the proportion of activities similar to business services in each sector.

1.16 Europe Economics (2007) suggests combining this productivity figure with a privatisation effect, a capital substitution effect and an input price effect. We do not follow Europe Economics' assumptions on these effects, as:

a) Ofgem has chosen an amount for the comparative competition effect to be used instead of a privatisation effect.

b) Europe Economics' calculation of capital substitution effects is vulnerable to the criticism that it relies on a labour share of value added in the gas distribution network sector, a figure that relates to the history and regulation of that sector and has no reasonable connection with the production process in which operating expenditure is incurred. Our method for taking account of capital growth, described below and in Section 4, avoids this problem.

c) Europe Economics' assumptions about input price trends are vulnerable to the criticisms made by First Economics. These criticisms also challenge the use of the 0.6 per cent figure calculated as the difference between comparator sector and whole economy TFP trends. The TFP figure of 2.0 per cent a year (shown in Europe Economics' Table 4.5), obtained without deducting the whole-economy TFP trend of 1.4 per cent a year, is not vulnerable to these criticisms.

1.17 Thus, in order to use Europe Economics' results to estimate a trend for gas distribution network operating expenditure, it is necessary to combine the 2.0 per cent productivity growth figure with assumptions on the comparative competition effect, capital substitution effect, and an input price assumption relative to RPI.

1.18 Because operating expenditure is obtained by aggregating value added across the upstream supply chain, intermediate inputs such as services and materials used by gas distribution networks must be in effect reduced to their labour and capital components (and natural resources and imports must be assumed to be negligible) in order to use value added measures of productivity to estimate operating expenditure trends. This means that the appropriate input price assumption is a wage trend rather than a weighted average of price trends for the labour and intermediate inputs used by companies.

1.19 Ofgem's assumptions in the initial proposals document were 0.9 per cent for the capital substitution effect, 1.0 per cent above RPI inflation for direct labour costs, and 1.1 per cent for the comparative competition effect.

1.20 Using these figures, the operating expenditure trend coming from the above analysis would be 3.0 per cent below RPI (calculated as 2.0 + 0.9 + 1.1 – 1.0).

1.21 This is a more demanding assumption than the 1.6 per cent above RPI figure obtained by Ofgem in the initial proposals. The main reason for the difference is that, by using the 0.6 per cent figure in Europe Economics (2007), Ofgem's calculation had implicitly assumed that input prices would rise by 0.9 per cent faster than RPI inflation plus whole economy TFP improvement.

New evidence on productivity trends

1.22 Europe Economics' analysis of productivity trends uses the NISEC02 dataset published by the National Institute of Economic and Social Research (NIESR) in 2002.[4] The NISEC02 dataset covers the period 1950 to 1999 for the UK. Europe Economics chose to focus on results for the period 1973–1999.

1.23 Several consultation responses have criticised Ofgem's reliance on a dataset that ends eight years ago.

1.24 We have updated this analysis by using the EU KLEMS dataset published in 2007 by a consortium including NIESR and the University of Groningen.[5] The EU KLEMS dataset covers the period 1970 to 2004 for the UK. In order to minimise differences with Europe Economics' analysis we report statistics for the period 1973–2004, taking as read Europe Economics' argument for starting the analysis in 1973.

1.25 Our approach to adjusting for capital substitution differs from Europe Economics', although it rests on the same concept of seeking to estimate trends in labour productivity on the assumption of constant capital input and constant output.

1.26 The difference is that we use each comparator sector's capital productivity growth and labour share of value data to adjust that sector's labour productivity growth data. We consider this to be preferable to Europe Economics' method of using a gas distribution labour share of value and a rate of capital substitution drawn from whole-economy statistics.

1.27 The underlying assumption of our approach is that rates of labour productivity growth (adjusted for capital growth) are comparable between the operating expenditure activities of gas distribution networks (and their relevant suppliers), and the entire activity of the comparator sectors. This seems as plausible as Europe Economics' assumption about the comparability of TFP growth, and it avoids the criticisms of Europe Economics' reliance on data such as the capital share of revenues, which are affected by assumptions of the regulatory process itself.

1.28 This change in method means that our results relate to capital-adjusted labour productivity improvement rather than TFP.

1.29 The EU KLEMS and NISEC02 datasets uses different categories and terminology for the classification of industries. This makes it difficult to use the same comparators as in Europe Economics (2007).

1.30 Given this, and the possible criticisms of Europe Economics' approach to choosing comparators and combining them, we have agreed with Ofgem a short list of comparator sectors to be highlighted. These results are shown on Table 1.

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[4] National Institute of Economic and Social Research (2002) *Britain's Relative Productivity Performance - National Institute sectoral productivity dataset (NISEC02)*, http://go.reckon.co.uk/s95513

[5] EU KLEMS Database, March 2007, http://www.euklems.net

Table 1 Capital-adjusted labour productivity growth based on value added 1973–2004

Construction	1.5%
Financial intermediation	0.1%
Manufacture of chemicals, chemical products and man-made fibres	4.8%
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	2.4%
Transport and storage	2.0%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

1.31 Section 3 outlines the basis on which these sectors were selected, and identifies some features that might need to be borne in mind when making inferences from these comparator sectors' data. Section 4 provides results for the same productivity growth measure as in Table 1 for all the sectors and sector groupings for which the EU KLEMS dataset includes the necessary data, and describes our data sources and methods.

1.32 The estimates in Table 1 relate to labour productivity growth (based on value added) adjusted for the effect of capital substitution. The comparable figure implied by the combination of Europe Economics' 2.0 per cent TFP figure and the assumption of a 0.9 per cent capital substitution effect in Ofgem's initial proposals is 2.9 per cent. In its initial proposals, Ofgem used an assumption of 2.5 per cent a year for productivity growth, comprising a 1.1 per cent comparative competition effect and a 1.4 per cent underlying growth. These figures lie within the range of results in Table 1.

Use of data from comparator sectors to infer trends for gas distribution

1.33 The figures in Table 1 relate to sectors which, although in some way similar to the operation of gas distribution networks, also have important differences with gas distribution and with each other. This raises the question of how these data might be used to inform a regulatory judgment on the trends to be assumed for the operating expenditure of gas distribution network operators.

1.34 We do not think that it is correct to take a weighted average of the figures in Table 1 as a point estimate to be applied to gas distribution networks. Doing so would amount to placing excessive reliance on a loose concept of similarity between the components of the gas distribution networks' activities and the chosen comparators for each component.

1.35 Instead, we take the view that we cannot know for certain to what extent the operation of gas distribution networks in the next decade will share relevant features of the comparator industries between 1973 and 2004. All we can hope for is that the spread of trends between the sectors shown in Table 1 represents a reasonable distribution of

possible outcomes for gas distribution over the next control period. This is a similar approach as in Europe Economics (2003b).[6]

1.36 It is for Ofgem to choose a figure to use in price control calculations in the face of the inherent uncertainty about future costs. In doing so, it will need to take into account the balance of risks and remuneration in the whole price control settlement in order to determine the appropriate trend to use for operating expenditure.

[6] Europe Economics (2003b) *Scope for efficiency improvement: uncertainties and measurement issues*, published by Ofwat, http://go.reckon.co.uk/s2424 (PDF)

2 REVIEW OF FIRST ECONOMICS (2007)

2.1 This section reviews the arguments presented in First Economics (2007) and Europe Economics (2007).

Arguments and evidence presented by First Economics

2.2 First Economics (2007) provides an analysis of trends in consumer prices for different types of consumer goods and services.

2.3 Its concludes that is that in recent years the average trend in prices for consumer services has been about 2 per cent faster than the all-items retail prices index (RPI). This is in particular the case for labour-intensive services involving the use of labour in the UK.

2.4 The average rate of RPI inflation is the combination of these rapid price increases and those in energy and housing costs with slower increases in food prices and reductions in prices of other goods.

2.5 First Economics finds that the significant role of imports in driving reduction of goods prices has disconnected the trend in the all-items RPI from the costs borne by efficient gas network distribution companies (which must use UK labour).

2.6 First Economics argues that this invalidates the approach used by Europe Economics to link operating expenditure trends to productivity improvement trends. First Economics also criticises Europe Economics' reliance on a dataset that ends in 1999 in the light of its finding that service price inflation accelerated significantly (relative to the RPI) from 1998.

2.7 According to First Economics, the observed trends in consumer prices point towards increases in operating expenditure faster than the RPI, even after taking account of capital substitution and of an assumed comparative competition effect of 1.1 per cent a year.

Implications of First Economics' arguments and evidence

2.8 We agree with First Economics' view that the method used by Europe Economics to connect input price inflation to the RPI using total factor productivity trends for the whole economy should not be relied upon. But this argument does not invalidate the use of Europe Economics' estimates of productivity improvement (without deducting whole-economy productivity improvement) in conjunction with appropriate input price trend estimates.

2.9 We agree with First Economics that trends in output prices for different sectors might be expected to convey information relevant to the estimation of operating expenditure trends for gas distribution networks. But First Economics' analysis omits to control for a number of factors.

2.10 First, consumer price trends and operating expenditure trends are not the same. We might reasonably expect the role of investment in plant and machinery to be small in

the labour-intensive factors on which First Economics' analysis focuses; if anything, the seemingly arbitrary adjustment for capital substitution proposed by First Economics may overestimate this effect.

2.11 But the use of consumer price data instead of productivity data introduces other differences between the observed trend and what might be expected to be relevant for operating expenditure, as a significant proportion of consumer prices in service industries is attributable to profit elements (see Table 2 for estimates of this proportion in sectors related to the product categories used by First Economics). These surpluses might include, for example, profits that cover the cost of periods of inactivity, remuneration of working capital, rents, and profits retained by successful entrepreneurs, creators (e.g. copyright royalties) or innovators (e.g. patent royalties). Trends in consumer prices are affected by these factors in a way that has no close parallel in gas distribution network operating expenditure.

Table 2 Gross operating surplus as a proportion of output at basic prices, 2003

Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	24%
Post and telecommunications	19%
Other service activities	30%
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale services of automotive fuel	14%
Publishing, printing and reproduction of recorded media	12%
Recreational, cultural and sporting activities	18%
Hotels and restaurants	14%
Whole economy	17%

Source: Reckon analysis of Eurostat data (http://go.reckon.co.uk/s72612)

2.12 Second, the time period chosen by First Economics, 1998–2006, is relatively short and explicitly selected as the period in which service price inflation has significantly exceeded goods price inflation. There is a risk that part of the discrepancy is in fact attributable to transitional factors, particular in elements of consumer prices not relevant to the analysis (for example, there might have been a fall in utilisation rates or an exceptional increase of profit margins or royalties). Given this risk, First Economics' results may not be reliable indicators of the productivity or price effects relevant to the estimation of trends in gas distribution network operating expenditure.

2.13 Third, the national minimum wage has led to significant increases on wages in low-paying sectors during the time period chosen by First Economics. The service industries identified by First Economics as comparators for cost trends in gas network industries include the main low-paying sectors. This may mean that price trends in these comparator sectors in 1998–2006 were affected by the national minimum wage policy in a way that is not reflected in gas distribution network operation, or in median hourly earnings trends (or even in low-paying industries for the future now that the Low Pay Commission considers that the phase of increases in the national minimum wage relative to average earnings is complete).

2.14 These factors indicate that the evidence presented by First Economics cannot, on its own, support an estimate of operating expenditure trends for gas distribution networks.

First Economics' main contentions

2.15 First Economics (2007) reaches the following conclusions:

a) Ofgem cannot rely on the analysis of productivity trends in comparator sectors in Europe Economics (2007), because that analysis ignores the effect of imports on the UK retail prices index (RPI).

b) There is no need for an analysis of productivity to estimate trends in operating expenditure for gas distribution networks by reference to comparator industries. A simpler and more accurate approach involves comparisons of the contributions that different sectors make to the change in the RPI. According to First Economics, the sectors most comparable to the operational aspects of gas distribution networks have seen unit costs rise around 2 per cent a year faster than the RPI.

2.16 First Economics calculates an operating expenditure trend for gas distribution networks by adjusting this RPI+2 benchmark for capital substitution and the assumed effects of comparative competition. The final conclusion is that the evidence falls well short of substantiating an assumption that it should be possible for operating expenditure of gas distribution networks to fall over time relative to the RPI.

First Economics' criticisms of Europe Economics (2007)

2.17 First Economics' main reason for rejecting the results in Europe Economics (2007) is given at Annex 2 of First Economics (2007).

2.18 This criticism is targeted at the relevance of the relationship set out in section 2.1 of First Economics (2007). According to this relationship, the change in consumer prices is the difference between the change in input prices and the improvement in total factor productivity in the whole economy. This relationship underpins Europe Economics' analysis of input prices and Europe Economics' reliance on measures of productivity out-performance relative to the whole economy.

Is the relationship drawn between productivity and input prices valid at all?

2.19 Before considering First Economics' specific arguments about Europe Economics (2007), it seems necessary to establish the basis of the relationship set out in section 2.1 of First Economics (2007).

2.20 First Economics (2007) does not specify the concept of total factor productivity used in this relationship. References to a whole-economy total factor productivity growth usually relate to a measure based on the excess of the rate of economic growth measured by value added compared to the weighted average of the rates of growth for labour and capital inputs. Such measures based on value added are used in NISEC02 and in Europe Economics (2007).

2.21 On that basis, the relationship quoted by First Economics (2007) only holds under the assumption that the only inputs are labour and capital, and therefore that the input price trend in the relationship is a weighted average of trends in wages and returns on capital.

2.22 To take account of imports and natural resources, it would be necessary to multiply the productivity trend with the proportion of output value that is accounted for by value added, as well as to incorporate the prices of imports and natural resources in the input price trend.

2.23 On that basis, we think that First Economics' evidence on the impact of imports on consumer prices invalidates the relevance of the relationship that appears to be endorsed in section 2.1 of First Economics (2007). This inconsistency does not invalidate First Economics' main analysis, which is based on consumer price trends and does not rely on either input price or productivity trends. We review this analysis below.

2.24 We note that Ofgem itself does not appear to have endorsed that relationship. The only reference that First Economics could find to it was in a report prepared by independent consultants for Ofgem: see footnote 2 of First Economics (2007).

Does this invalidate the results in Europe Economics (2007)?

2.25 First Economics (2007) correctly identifies the relationship which is set out in section 2.1 as an assumption that is relied upon by Europe Economics (2007). If this relationship is invalidated by the impact of imports on prices, as is argued in the previous subsection, then the results of Europe Economics (2007) fall with it.

2.26 Furthermore, we consider that the arguments in Annex 2 of First Economics (2007) are correct and well made, and that they would be sufficient to invalidate Europe Economics' reliance on a relationship between input price changes and whole-economy total factor productivity improvement.

2.27 In summary, we agree, albeit on slightly different grounds, with First Economics' conclusion that Europe Economics' reliance on a concept of total factor productivity out-performance relative to the whole economy is not a safe way of taking account of input price trends in the context of an open economy in which imports have a significant impact on prices.

First Economics' criticism of the time period used in Europe Economics (2007)

2.28 First Economics (2007) criticises Europe Economics (2007) for relying on a dataset ending in 1999.

2.29 According to First Economics' analysis of consumer prices, different trends have prevailed before and after about 1999. But First Economics' analysis of consumer prices cannot show whether the change in trend affects productivity or relates to prices only. First Economics' criticism does not therefore invalidate Europe Economics' argument that the aim of the analysis is to extract a long-term trend in productivity improvement.

First Economics' criticism of the comparators used in Europe Economics (2007)

2.30 First Economics (2007) finds it odd that Europe Economics (2007) uses the machinery and equipment industry as a comparator for operating expenditure.

2.31 We agree that Europe Economics (2007) assumption (see Table 4.2 in Europe Economics (2007)) that more than half of operating expenditure is "capital and replacement expenditure" is rather odd, and that the "engineering" label might be misleading for a comparator sector comprising manufacturing activities.

2.32 But we do not see that this absolutely invalidates the use of productivity trends in factories producing machinery and equipment as an indicator of productivity trends in gas distribution facilities.

2.33 First Economics (2007) also argues that Europe Economics' use of the utility sector creates circularity.

2.34 We do not see the criticism. It seems reasonable to use past trends in network industries as an indicator of future trends in network industries, and Europe Economics (2007) use of a privatisation effect explanatory variable in its regression seeks to take account of the hypothesis that there was exceptional productivity growth in the utility sectors in the 1990s for reasons related to privatisation and regulatory changes.

2.35 The details of Europe Economics' method might be vulnerable to criticism, but First Economics' broad complaint about circularity seems unfounded.

First Economics' criticism of the privatisation effect in Europe Economics (2007)

2.36 First Economics criticises Europe Economics (2007) for the magnitude of the privatisation effect that it includes.

2.37 This argument need not affect Ofgem's use of Europe Economics' results. In particular, it does not invalidate an Ofgem approach based on using Europe Economics' analysis subject to the replacement of the privatisation effect estimated by Europe Economics with a comparative competition effect determined by Ofgem.

First Economics' use of the Europe Economics (2007) adjustment for capital substitution

2.38 First Economics' comment on Europe Economics' adjustment for capital substitution is that it "is not directly applicable to our calculations because of the different methodologies that we have adopted".

2.39 We agree that there is such a difference, but we do not think that First Economics' approach of making an adjustment equal to half of the Europe Economics (2007) range is tenable.

Which parts of Europe Economics (2007) can still be relied on?

2.40 In summary, taking it at its widest, First Economics' critique of Europe Economics (2007) invalidates Europe Economics' input price assumptions, and nothing else.

2.41 None of these criticisms affect Ofgem's possible use of results from a productivity trend analysis conducted along similar lines as Europe Economics (2007).

2.42 Nonetheless, we think that there might be some aspects of the productivity improvement estimates in Europe Economics (2007) that are vulnerable to criticism. The analysis in Sections 3 and 4 of this report seeks to address these.

First Economics' analysis of trends in comparator sectors

2.43 Instead of considering productivity trends for different economic activities, First Economics (2007) focuses on consumer prices for different types of goods and services.

Benefits of First Economics' approach

2.44 This approach is attractive in terms of data availability: UK consumer price information is timely and is generally trusted as accurate. These are major advantages compared to data processed from the national accounts by academic researchers, which become available with at best a two-year lag:

a) The NISEC02 dataset produced by NIESR in 2002 ends in 1999.

b) The University of Groningen dataset last updated in late 2005 (for the UK) ends in 2003.[7] This only extends the parts of the NISEC02 data related to labour productivity trends.

c) The EU KLEMS dataset published on 15 March 2007 ends in 2004. This extends all the time series in NISEC02 and contains some further information.

2.45 Furthermore, the analysis in First Economics (2007) is simple and easy to follow. We have not checked the results but there is no reason to doubt their accuracy.

Does First Economics (2007) measure the right thing?

2.46 Given these advantages of the First Economics method, the only question is whether First Economics' analysis measures something that is useful to Ofgem. This can be expressed by the following two questions:

a) Are the goods and services used as comparators in First Economics (2007) sufficiently related to the activities comprised in operating expenditure by gas distribution networks?

b) Is the measure of cost implicit in consumer price indices sufficiently related to the operating expenditure by gas distribution networks?

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[7] Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net. As of 21 September 2996, the last update for the UK data was shown as October 2005. Direct link: http://go.reckon.co.uk/s84910.

2.47 These two questions are related: in both cases the main difficulty is in reconciling a price for a consumer product with the activity of operating a gas distribution network. The differences between these two concepts include:

a) Consumer prices include the profits of suppliers and distributors together with the costs of production. Operating expenditure does not.

b) Consumer prices relate to goods or services. The activities that give rise to a gas distribution network's operating expenditure generate no recognisable product on their own.

c) How are "domestic services" or "personal services" related to the operation of gas distribution networks?

2.48 All methods based on comparators are to some extent vulnerable to the type of criticism noted above, particularly (c), and it would be wrong to reject First Economics' evidence on those grounds, especially given that the sensitivity analysis presented in First Economics (2007) suggest that the strong discrepancy between First Economics' and Europe Economics' results is not too dependent on the specific choice of comparator goods and services.

2.49 Criticisms (a) and (b) are more difficult to ignore. Even in the labour-intensive sectors selected by First Economics, only a proportion of consumer prices is accounted for by operating expenditure, and changes in profitability rates or capital employed can reasonably be expected to have a significant effect on price trends, particularly when measured over a relatively short period; First Economics (2007) uses 1998–2006.

2.50 The difficulty in analysing differences between trends in prices and operating expenditure is best illustrated by the adjustment that First Economics makes on account of the "labour-capital mix".

2.51 First Economics (2007) bases its adjustment under this heading on half of the number estimated in Europe Economics (2007) for a capital substitution effect, with no justification for this assumption.

2.52 In fact, First Economics (2007) presents no evidence that operating expenditure for gas distribution networks is affected by capital substitution in a different way than in the comparators. The fact that First Economics decided to estimate that gas network operating expenditure would increase by a seemingly arbitrary and non-negligible 0.6–0.75 per cent a year slower than allegedly comparable consumer prices does not inspire confidence in the use of consumer price trends as a benchmark for operating expenditure trends.

Implications for Ofgem of First Economics' analysis

Impact on the use of Europe Economics' results

2.53 First Economics' criticisms invalidate the input price assumption in Europe Economics (2007).

2.54 First Economics' criticisms do not, by themselves, invalidate Ofgem's possible use of results from a productivity trend analysis conducted along similar lines as Europe Economics (2007). But they highlight the scope for this analysis to be reviewed, particularly with respect to the time period used for the analysis and the treatment of adjustments such as the one for capital substitution.

Possible use of First Economics' results

2.55 In addition to its criticisms of Europe Economics (2007), First Economics (2007) proposes a completely different approach based on consumer prices, which does not distinguish between effects attributable to input prices and effects attributable to productivity improvements.

2.56 Ofgem cannot incorporate the results of First Economics (2007) within an analysis based on separate productivity and input price trends for gas distribution networks, but it could in principle use First Economics' results to inform its productivity or its input price trend estimates.

2.57 The question is therefore whether the evidence presented by First Economics has sufficient probative value to displace the assumptions made on the basis of the type of analysis set out in Europe Economics (2007) or in Section 3 of this report.

2.58 The discrepancy between First Economics' results and the approach used by Ofgem in the initial proposals is stark: the increases in consumer prices reported by First Economics exceed the increases in hourly wages reported in the sources quoted by Ofgem. This appears to imply negative labour productivity improvement, which seems implausible: why would the production processes or general management practices in these sectors have become worse, in absolute terms, over time?

2.59 Thus, the main challenge raised by First Economics (2007) is to Ofgem's input price assumptions.

2.60 As noted earlier in this report, there are a number of factors that have affected trends in consumer prices but would not have had the same effects on wage statistics:

a) A significant proportion of consumer prices in service industries is attributable to profit elements, which may vary over time (at least over the relatively short period considered by First Economics) in ways unrelated to any productivity improvement or capital substitution.

b) The national minimum wage has led to significant increases on wages in low-paying sectors during the time period chosen by First Economics. This will have affected some of the consumer prices used by First Economics but will have had much less effect of median wage statistics or on wage trends for the types of staff employed by gas distribution network operators.

2.61 An additional factor which could contribute to the apparent inconsistency between wage statistics and consumer prices is the potential difference between the rates of growth of wages and total labour costs. Differences between the two measures might

have arisen from, for example, additional costs to employers from National Insurance contributions, pensions or insurance.

2.62 If these factors are sufficient to explain the implied negative labour productivity improvement noted above, then First Economics' challenge to Ofgem's method of analysis fails.

2.63 This leaves the question of whether the factors listed above might affect the wage trend used by Ofgem. Given that the workforce of gas distribution companies is not likely to be materially affected by the national minimum wage, the only potentially important factor is the distinction between wages and total labour costs. But Ofgem will not need to make any such adjustment if it chooses instead to make specific allowances for these additional tax, pension or insurance costs in the price control calculations.

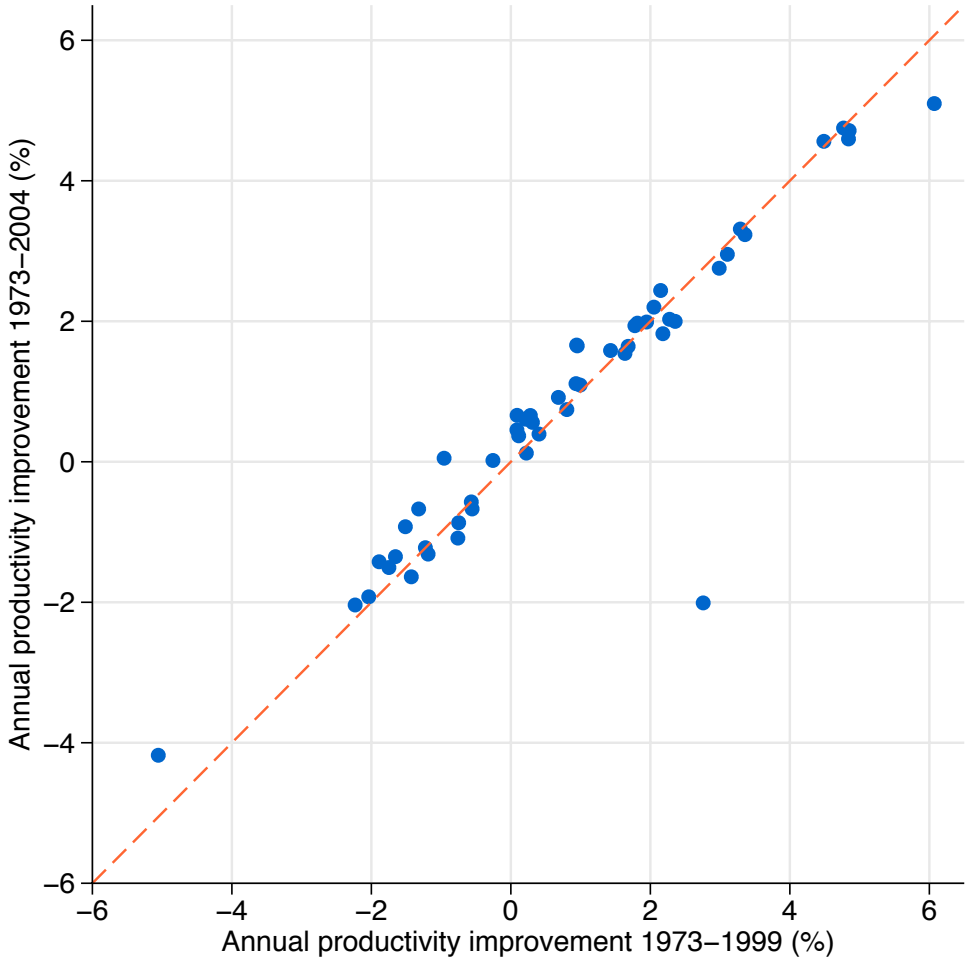
3 NEW EVIDENCE ON PRODUCTIVITY TRENDS

Results for productivity trends in all sectors

3.1 Tables 3 and 4 below show the headline results of our analysis of productivity trends in different sectors of the British economy over the periods 1973–1999 and 1973–2004. The results are based on the EU KLEMS dataset. Section 4 provides additional results and information about the methods used.

3.2 Figure 1 illustrates the difference between the two data periods.

Figure 1 Capital-adjusted labour productivity growth, 1973–1999 and 1973–2004



Source: Reckon analysis of EU KLEMS data

3.3 The productivity growth figures shown in Tables 3 and 4 refer to a measure of annual labour productivity improvement based on value added corrected for the effect of capital substitution. This is a proxy for the increase in labour productivity that would have been achieved if capital growth had been held in line with output growth.

3.4 This capital-adjusted measure is generally lower than raw labour productivity growth, because part of the improvement in labour productivity is only achievable thanks to an increase in the amount of plant and machinery used in the production processes.

Table 3 Capital-adjusted labour productivity growth based on value added (all sectors)

Comparator sector	1973–2004	1973–1999
Electricity, gas and water supply	5.1%	6.1%
Manufacture of chemicals, chemical products and man-made fibres	4.8%	4.8%
Post and telecommunications	4.6%	4.8%
Manufacture of electrical and optical equipment	4.6%	4.5%
Agriculture, hunting, forestry and fishing	3.3%	3.3%
Manufacture of transport equipment	3.0%	3.1%
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	2.4%	2.1%
Manufacture of basic metals and fabricated metal products	2.2%	2.1%
Transport and storage	2.0%	2.3%
Manufacture of rubber and plastic products	2.0%	2.4%
Manufacture of textiles, textile products, clothing and footwear	1.7%	0.9%
Manufacture of other non-metallic mineral products	1.6%	1.0%
Construction	1.5%	1.6%
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	0.9%	0.7%
Manufacture of pulp, paper and paper products; publishing and printing	0.7%	0.8%
Manufacture of machinery and equipment not elsewhere classified	0.7%	0.1%
Manufacture of food products, beverages and tobacco	0.6%	0.3%
Manufacture of wood and wood products	0.4%	0.1%
Health and social work	0.1%	0.2%
Financial intermediation	0.1%	–1.0%
Public administration and defence; compulsory social security	–0.6%	–0.6%
Wholesale trade and commission trade, except of motor vehicles and motorcycles	–0.7%	–1.3%
Other community, social and personal service activities	–1.3%	–1.2%
Renting of machinery and equipment; research; consultancy; other business activities	–1.4%	–1.9%
Hotels and restaurants	–1.5%	–1.7%
Education	–1.6%	–1.4%
Mining and quarrying	–2.0%	2.8%
Manufacture of coke, refined petroleum products and nuclear fuel	–2.0%	–2.2%
Manufacturing not elsewhere classified, including recycling	–4.2%	–5.1%
Real estate activities	–10.2%	–6.4%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

Table 4 Capital-adjusted labour productivity growth based on value added (sector aggregates)

Comparator sector aggregate	1973–2004	1973–1999
Electrical machinery, post and communication services	4.7%	4.8%
Manufacture of chemical, rubber, plastic and fuel products	3.2%	3.4%
Transport and storage and communication	2.8%	3.0%
Intermediate manufacturing	2.0%	1.9%
Manufacture of non-high-tech investment goods	2.0%	1.8%
Manufacturing	1.9%	1.8%
Other production	1.8%	2.2%
Goods producing, excluding electrical machinery	1.6%	1.7%
Manufacturing, excluding electrical	1.6%	1.4%
Distribution	1.1%	0.9%
Market economy	1.1%	1.0%
Wholesale and retail trade	0.7%	0.3%
Trade	0.6%	0.2%
Consumer manufacturing	0.5%	0.1%
Whole economy	0.4%	0.4%
Market services, excluding post and telecommunications	0.0%	–0.3%
Public admin, education and health	–0.7%	–0.6%
Community social and personal service activities	–0.9%	–0.7%
Finance and business, except real estate	–0.9%	–1.5%
Non-market services	–1.1%	–0.8%
Personal services	–1.2%	–1.2%
Finance, insurance, real estate and business services	–1.4%	–1.7%
Real estate, renting and business activities	–1.9%	–2.0%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

Selection of comparator sectors to highlight

3.5 From the sectors in Table 3 above, we agreed with Ofgem to focus on the following:

a) Construction.

b) Financial intermediation.

c) Manufacture of chemicals, chemical products and man-made fibres.

d) Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel.

e) Transport and storage.

3.6 We now summarise the factors taken into account to select these comparator sectors.

Differences with Europe Economics (2007)

3.7 This selection of comparator sectors is different from that in Europe Economics (2007). As shown in Section 4, the labelling of the sectors in the EU KLEMS dataset is different from that in the NISEC02 dataset used by Europe Economics, so a direct correspondence would not have been possible.

3.8 Furthermore, instead of looking for sectors that share some general economic features with gas distribution networks, we focused on sectors in which the main activities are similar in terms of their use of labour and materials to the operating activities of gas distribution network operators.

3.9 In contrast to Europe Economics (2007), we took no account of the gas distribution networks' investment and replacement expenditure activities, since the aim of the work is to determine a trend applicable to operating expenditure.

Exclusion of mining and quarrying

3.10 We considered the possibility of including mining and quarrying, and rejected it for much the same reasons as Europe Economics (2003a)[8] — essentially because capacity utilisation is an important determinant of productivity and relates to natural resources and commodity price changes rather than to changes in working practices or technologies that might be comparable to those affecting the operating activities of gas distribution network operators.

Exclusion of electricity, gas and water

3.11 We considered and rejected the possibility of including the electricity, gas and water supply sector.

3.12 This was mainly because the national accounts data relates to the totality of these sectors, including generation and supply activities, and a significant amount of capital expenditure for network businesses. Furthermore, the output and value added recorded for network businesses is likely to include the value of assets constructed on the network.

3.13 As such, this dataset may not be a good comparator for the operating activities of gas distribution network operators.

3.14 We were also concerned about the meaning of a value added measure of productivity in a sector in which prices are regulated.

3.15 Figure 2 shows that the productivity data reported in EU KLEMS for electricity, gas and water supply. The shock in 1984 is much larger than those observed in the sectors on which we have focused (see Section 4).

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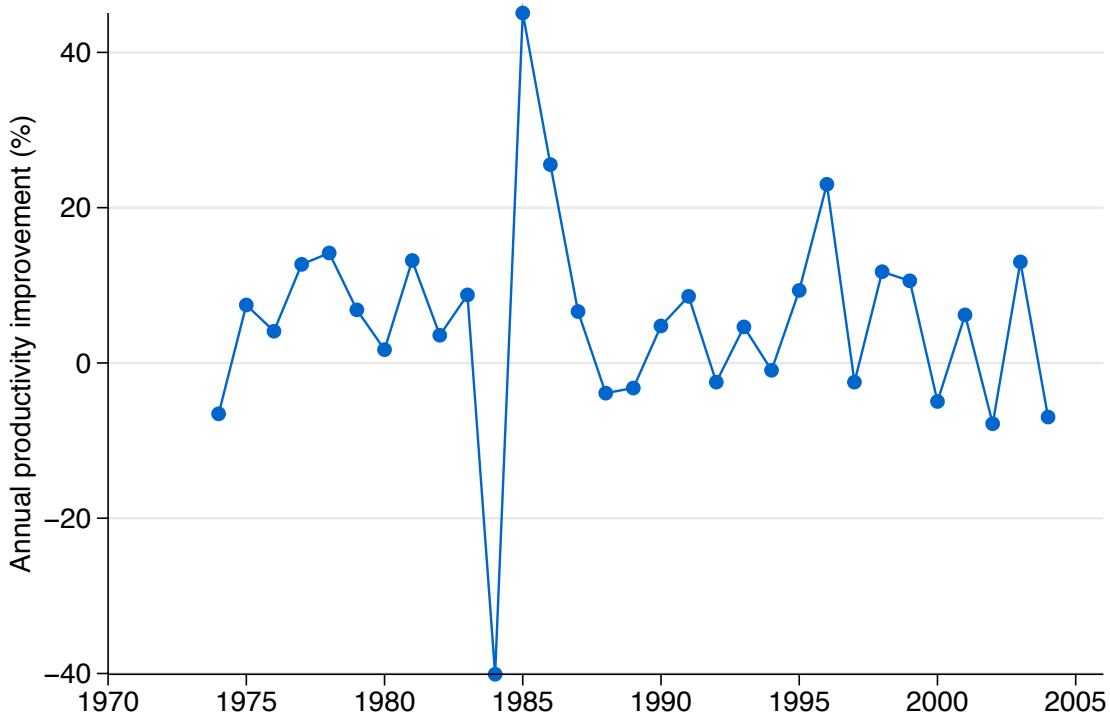
[8] Europe Economics (2003a) *Scope for efficiency improvement in the water and sewerage industries*, published by Ofwat, http://go.reckon.co.uk/s830

Figure 2 Annual capital-adjusted productivity growth for electricity, gas and water supply



Source: Reckon analysis of EU KLEMS data

3.16 Had we wanted to include the electricity, gas and water supply sector as a comparator, we would have needed to take account of a possible privatisation effect in the late 1980s, 1990s and possibly 2000s. Doing this using a privatisation index variable akin to that used in Europe Economics (2007) would have essentially the same effect as removing data for the affected period from the comparator dataset.

Privatisation effects in comparator sectors

3.17 Some of the other sectors highlighted as comparators may also have been affected by privatisation and related processes. This is mostly relevant to the transport and storage sector: air transport was privatised in 1987, rail transport was privatised between 1995 and 1997 and returned in part to State financing in 2001–2002, and bus transport was gradually privatised from 1986. It might also be argued that the de-mutualisation processes in the financial intermediation sector share some features with privatisation. We suggest that these features be taken into account when using the results to make assumptions about operating expenditure trends for gas distribution networks, rather than as adjustments to the productivity records of comparator industries.

4 DETAILED RESULTS, SOURCES AND METHODS

Comparison with EU KLEMS results

4.1 The tables on the following pages provide the results obtained from applying the methods described at the end of this section to the EU KLEMS data for the UK. These tables should be read in conjunction with Tables 3 and 4 in Section 3 and the text below.

4.2 Each table is sorted in decreasing order of productivity growth for the main measure reported on each table, and data relating to the EU KLEMS dataset are split into two tables relating to disaggregated industry classifications and to aggregates of industry classifications.

4.3 Tables 4 and 5 list the sectors and aggregates for which EU KLEMS provides data.

Discrepancies between different EU KLEMS data sources for TFP

4.4 The two measures of TFP growth reported in Tables 7 and 8 correspond to different ways of processing the EU KLEMS data:

a) $g(TFPI_{VA})$ is based on the TFP index included in the EU KLEMS dataset.

b) $g(TFP_{VA})$ is TFP growth calculated on the basis of the labour, capital and value added values and volumes indices in the EU KLEMS dataset.

4.5 The third series $g(LP_{VAadj})$ is the average growth in labour productivity adjusted for capital substitution.

4.6 The data in Tables 7 and 8 show that there are some differences between the growth in TFP index reported by EU KLEMS and the growth in TFP that we have calculated using the underlying labour, capital and value added series from the EU KLEMS dataset. These estimates are expressed as annual growth rates (in logarithms) for 1973–1999, the time period used in Europe Economics (2007).

4.7 This discrepancy suggests that the method used to calculate the TFP indices differs from the method we have used to calculate the productivity growth: it seems likely that different weights have been used than the ones that we have calculated based on the EU KLEMS data.

4.8 Using other series in the EU KLEMS dataset, we have calculated the weights of labour and capital implied in the EU KLEMS TFP growth estimate. These weights are different from the ones estimated directly from the EU KLEMS dataset. Furthermore, in some years and for some sectors, these implied weights do not add up to a figure close to unity.

4.9 We believe that the reason behind this discrepancy is that the value added volume growth series is taken from national accounts (in constant prices) rather than calculated using the other series in the dataset.

Discrepancies between EU KLEMS and NISEC02 for 1973–1999 data

4.10 Table 9 shows the same measures of growth in TFP and labour adjusted for capital substitution as in Tables 7 and 8, but using the NISEC02 dataset instead of the EU KLEMS dataset. A direct line-by-line comparison between these tables cannot be made as the sector definitions are different, and data periods vary due to missing data points in NISEC02.

4.11 Comparing Tables 7, 8 and 9 nevertheless shows that the rates of value added TFP growth estimated from the EU KLEMS and NISEC02 datasets over the same period (1973–1999) are different, even for the sectors that appear to be almost identical. This suggests that revisions have been made to the data between the compilation of NISEC02 and EU KLEMS.

Effect of adding the last five years of data

4.12 Tables 10 and 11 show the effect on the value added TFP growth trend of extending the time period end from 1999 to 2004. We have kept the starting point at 1973 to be consistent with the arguments presented in Europe Economics (2007).

4.13 The effect of the last five years of data on the capital-adjusted labour productivity growth measures is shown in Figure 1 and Tables 3 and 4 in Section 3.

Table 5 Sectors at the lowest available level of disaggregation in the EU KLEMS dataset

Comparator sector	NACE letters	NACE codes
Agriculture, hunting, forestry and fishing	A–B	1–5
Mining and quarrying	C	10–14
Manufacture of food products, beverages and tobacco	DA	15–16
Manufacture of textiles, textile products, clothing and footwear	DB–DC	17–19
Manufacture of wood and wood products	DD	20
Manufacture of pulp, paper and paper products; publishing and printing	DE	21–22
Manufacture of coke, refined petroleum products and nuclear fuel	DF	23
Manufacture of chemicals, chemical products and man-made fibres	DG	24
Manufacture of rubber and plastic products	DH	25
Manufacture of other non-metallic mineral products	DI	26
Manufacture of basic metals and fabricated metal products	DJ	27–28
Manufacture of machinery and equipment not elsewhere classified	DK	29
Manufacture of electrical and optical equipment	DL	30–33
Manufacture of transport equipment	DM	34–35
Manufacturing not elsewhere classified, including recycling	DN	36–37
Electricity, gas and water supply	E	40–41
Construction	F	45
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	G.50	50
Wholesale trade and commission trade, except of motor vehicles and motorcycles	G.51	51
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	G.52	52
Hotels and restaurants	H	55
Transport and storage	I.60–I.63	60–63
Post and telecommunications	I.64	64
Financial intermediation	J	65–67
Real estate activities	K.70	70
Renting of machinery and equipment; research; consultancy; other business activities	K.71–K.74	71–74
Public administration and defence; compulsory social security	L	75
Education	M	80
Health and social work	N	85
Other community, social and personal service activities	O	90–93

Sources: Classification of Economic Activities in the European Community (NACE) revision 1 and EU KLEMS dataset

Table 6 Additional sector aggregates included in the EU KLEMS dataset

Comparator sector aggregate	NACE letters	NACE codes
Manufacture of chemical, rubber, plastic and fuel products	DF–DH	23–25
Trade	G	50–52
Manufacturing	D	15–37
Wholesale and retail trade	G	50–52
Transport and storage and communication	I	60–64
Finance, insurance, real estate and business services	J–K	65–74
Real estate, renting and business activities	K	70–74
Public admin, education and health	L–N	75–85
Community social and personal service activities	L–Q	75–99
Distribution		
Electrical machinery, post and communication services		
Finance and business, except real estate		
Goods producing, excluding electrical machinery		
Market economy		
Market services, excluding post and telecommunications		
Consumer manufacturing		
Manufacturing, excluding electrical		
Intermediate manufacturing		
Manufacture of non-high-tech investment goods		
Non-market services		
Other production		
Personal services		
Whole economy		

Sources: Classification of Economic Activities in the European Community (NACE) revision 1 and EU KLEMS dataset

Table 7 EU KLEMS value added productivity trends 1973–1999 (all sectors)

Comparator sector	$g(TFPI_{VA})$	$g(TFP_{VA})$	$g(LP_{VAadj})$
Manufacture of chemicals, chemical products and man-made fibres	3.3%	3.1%	4.8%
Manufacture of transport equipment	3.1%	3.5%	3.1%
Manufacture of electrical and optical equipment	3.1%	3.0%	4.5%
Post and telecommunications	3.0%	3.2%	4.8%
Electricity, gas and water supply	2.3%	2.2%	6.1%
Agriculture, hunting, forestry and fishing	2.2%	2.2%	3.3%
Transport and storage	2.2%	2.1%	2.3%
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	1.8%	1.7%	2.1%
Manufacture of rubber and plastic products	1.7%	1.5%	2.4%
Manufacture of basic metals and fabricated metal products	1.6%	1.5%	2.1%
Construction	1.5%	1.2%	1.6%
Manufacture of textiles, textile products, clothing and footwear	0.9%	0.8%	0.9%
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	0.7%	0.8%	0.7%
Manufacture of other non-metallic mineral products	0.7%	0.3%	1.0%
Manufacture of pulp, paper and paper products; publishing and printing	0.6%	0.4%	0.8%
Mining and quarrying	0.5%	0.5%	2.8%
Health and social work	0.2%	0.3%	0.2%
Manufacture of food products, beverages and tobacco	0.2%	0.1%	0.3%
Manufacture of machinery and equipment not elsewhere classified	0.2%	0.0%	0.1%
Manufacture of wood and wood products	0.0%	0.0%	0.1%
Public administration and defence; compulsory social security	–0.5%	–0.9%	–0.6%
Financial intermediation	–0.6%	–0.8%	–1.0%
Other community, social and personal service activities	–0.8%	–0.7%	–1.2%
Hotels and restaurants	–0.8%	–0.9%	–1.7%
Wholesale trade and commission trade, except of motor vehicles and motorcycles	–1.0%	–1.3%	–1.3%
Real estate activities	–1.0%	–1.1%	–6.4%
Renting of machinery and equipment; research; consultancy; other business activities	–1.3%	–1.2%	–1.9%
Education	–1.3%	–1.3%	–1.4%
Manufacture of coke, refined petroleum products and nuclear fuel	–1.3%	–1.6%	–2.2%
Manufacturing not elsewhere classified, including recycling	–3.4%	–3.6%	–5.1%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

Table 8 EU KLEMS value added productivity trends 1973–1999 (sector aggregates)

Comparator sector aggregate	$g(TFPI_{VA})$	$g(TFP_{VA})$	$g(LP_{VAadj})$
Electrical machinery, post and communication services	3.1%	3.1%	4.8%
Transport and storage and communication	2.4%	2.4%	3.0%
Manufacture of chemical, rubber, plastic and fuel products	2.2%	2.0%	3.4%
Manufacture of non-high-tech investment goods	1.7%	1.4%	1.8%
Intermediate manufacturing	1.4%	1.2%	1.9%
Manufacturing	1.4%	1.2%	1.8%
Other production	1.3%	1.1%	2.2%
Manufacturing, excluding electrical	1.1%	0.9%	1.4%
Goods producing, excluding electrical machinery	1.1%	0.9%	1.7%
Distribution	0.8%	0.7%	0.9%
Market economy	0.7%	0.6%	1.0%
Whole economy	0.3%	0.3%	0.4%
Wholesale and retail trade	0.3%	0.2%	0.3%
Trade	0.2%	0.1%	0.2%
Consumer manufacturing	0.1%	0.0%	0.1%
Market services, excluding post and telecommunications	–0.2%	–0.2%	–0.3%
Public admin, education and health	–0.5%	–0.7%	–0.6%
Non-market services	–0.6%	–0.7%	–0.8%
Community social and personal service activities	–0.6%	–0.7%	–0.7%
Personal services	–0.8%	–0.5%	–1.2%
Finance, insurance, real estate and business services	–1.0%	–0.9%	–1.7%
Real estate, renting and business activities	–1.0%	–0.9%	–2.0%
Finance and business, except real estate	–1.1%	–1.2%	–1.5%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

Table 9 NISEC02 value added productivity trends (all sectors and aggregates)

Comparator sector or aggregate	TFP data period	g($TFPI_{VA}$)	g(LP_{VAadj})
Office equipment	1973–1999	3.5%	6.5%
Other Manufacture of transport equipment	1973–1999	3.4%	3.8%
Transport & communications	1973–1999	3.1%	4.1%
Communications	1973–1999	3.1%	5.0%
Electrical & electronic equipment	1973–1999	2.9%	3.6%
Electricity, gas and water	1973–1999	2.9%	6.8%
Transport	1973–1999	2.6%	3.1%
Optical equipment & instruments	1973–1999	2.5%	2.8%
Agriculture, forestry & fishing	1973–1999	2.2%	3.9%
Manufacturing	1973–1999	2.1%	2.8%
Total machinery & equipment	1973–1999	2.1%	2.4%
Motor vehicles	1973–1999	2.1%	2.3%
Wholesale trade	1989–1999	2.0%	No labour share data
Chemicals	1973–1999	2.0%	3.3%
Textiles, clothing & leather	1973–1999	1.7%	2.1%
Chemicals & allied products	1973–1999	1.7%	2.6%
Total market sectors	1973–1999	1.4%	2.0%
Whole economy	1973–1999	1.3%	1.9%
Construction	1973–1999	1.3%	1.7%
Paper & printing	1973–1999	1.3%	1.7%
Rubber & plastics	1973–1999	1.2%	1.6%
Other manufacturing	1973–1999	1.1%	1.4%
Basic metals & fabricated metal products	1973–1999	1.0%	1.2%
Financial & business services	1973–1999	1.0%	1.5%
Non-market services	1973–1999	1.0%	1.1%
Financial intermediation	1989–1999	0.9%	No labour share data
Business services	1989–1999	0.8%	No labour share data
Coal & petroleum products	1973–1999	0.7%	0.1%
Food, drink & tobacco	1973–1999	0.4%	0.7%
Machinery	1973–1999	0.4%	0.4%
Retail trade	1973–1999	0.4%	No labour share data
Distributive trades	1973–1999	0.3%	0.4%
Miscellaneous personal services	1973–1999	0.2%	0.4%
Wood products	1973–1999	0.2%	0.4%
Non-metallic mineral products	1973–1999	–0.3%	–0.2%
Mining & extraction	1973–1999	–0.3%	2.5%
Furniture & miscellaneous manufacturing	1973–1999	–0.4%	–0.9%
Hotels & catering	1973–1999	–2.0%	No labour share data

Annual rates of change are expressed in terms of expenditure reductions.
Source: Reckon analysis of NIESR data

Table 10 EU KLEMS value added TFP trends: 1973–1999 and 1973–2004 (all sectors)

Comparator sector	g($TFPI_{VA}$)	
	1973–1999	1973–2004
Manufacture of chemicals, chemical products and man-made fibres	3.3%	3.2%
Manufacture of transport equipment	3.1%	2.9%
Manufacture of electrical and optical equipment	3.1%	3.2%
Post and telecommunications	3.0%	2.9%
Electricity, gas and water supply	2.3%	1.9%
Agriculture, hunting, forestry and fishing	2.2%	2.2%
Transport and storage	2.2%	1.9%
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	1.8%	2.0%
Manufacture of rubber and plastic products	1.7%	1.5%
Manufacture of basic metals and fabricated metal products	1.6%	1.8%
Construction	1.5%	1.4%
Manufacture of textiles, textile products, clothing and footwear	0.9%	1.5%
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	0.7%	0.8%
Manufacture of other non-metallic mineral products	0.7%	1.2%
Manufacture of pulp, paper and paper products; publishing and printing	0.6%	0.6%
Mining and quarrying	0.5%	–0.1%
Health and social work	0.2%	0.2%
Manufacture of food products, beverages and tobacco	0.2%	0.4%
Manufacture of machinery and equipment not elsewhere classified	0.2%	0.6%
Manufacture of wood and wood products	0.0%	0.2%
Public administration and defence; compulsory social security	–0.5%	–0.5%
Financial intermediation	–0.6%	0.0%
Other community, social and personal service activities	–0.8%	–0.9%
Hotels and restaurants	–0.8%	–0.7%
Wholesale trade and commission trade, except of motor vehicles and motorcycles	–1.0%	–0.5%
Real estate activities	–1.0%	–1.4%
Renting of machinery and equipment; research; consultancy; other business activities	–1.3%	–0.9%
Education	–1.3%	–1.5%
Manufacture of coke, refined petroleum products and nuclear fuel	–1.3%	–1.2%
Manufacturing not elsewhere classified, including recycling	–3.4%	–2.8%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

Table 11 EU KLEMS value added TFP trends: 1973–1999 and 1973–2004 (sector aggregates)

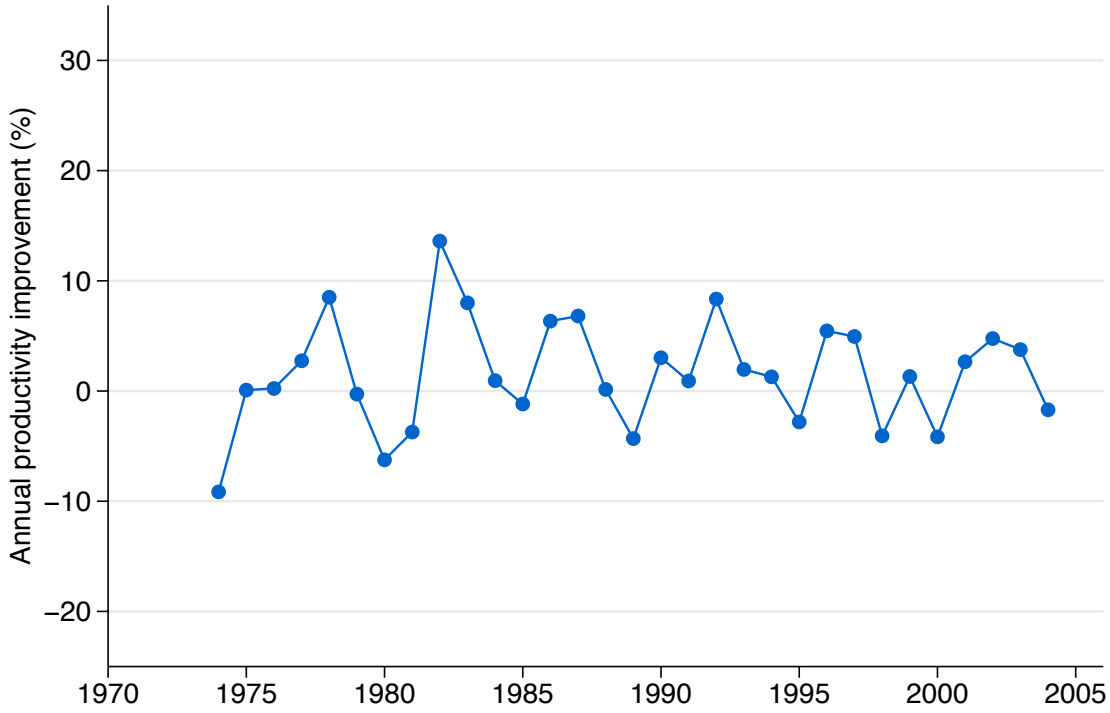
Comparator sector aggregate	$g(TFPI_{VA})$	
	1973–1999	1973–2004
Electrical machinery, post and communication services	3.1%	3.1%
Transport and storage and communication	2.4%	2.2%
Manufacture of chemical, rubber, plastic and fuel products	2.2%	2.2%
Manufacture of non-high-tech investment goods	1.7%	1.8%
Intermediate manufacturing	1.4%	1.5%
Manufacturing	1.4%	1.5%
Other production	1.3%	1.1%
Manufacturing, excluding electrical	1.1%	1.3%
Goods producing, excluding electrical machinery	1.1%	1.1%
Distribution	0.8%	0.9%
Market economy	0.7%	0.8%
Whole economy	0.3%	0.3%
Wholesale and retail trade	0.3%	0.5%
Trade	0.2%	0.5%
Consumer manufacturing	0.1%	0.4%
Market services, excluding post and telecommunications	–0.2%	0.0%
Public admin, education and health	–0.5%	–0.6%
Non-market services	–0.6%	–0.8%
Community social and personal service activities	–0.6%	–0.7%
Personal services	–0.8%	–0.8%
Finance, insurance, real estate and business services	–1.0%	–0.8%
Real estate, renting and business activities	–1.0%	–0.9%
Finance and business, except real estate	–1.1%	–0.7%

Annual rates of change are expressed in terms of expenditure reductions
Source: Reckon analysis of EU KLEMS data

Time profile of productivity improvements in comparator sectors

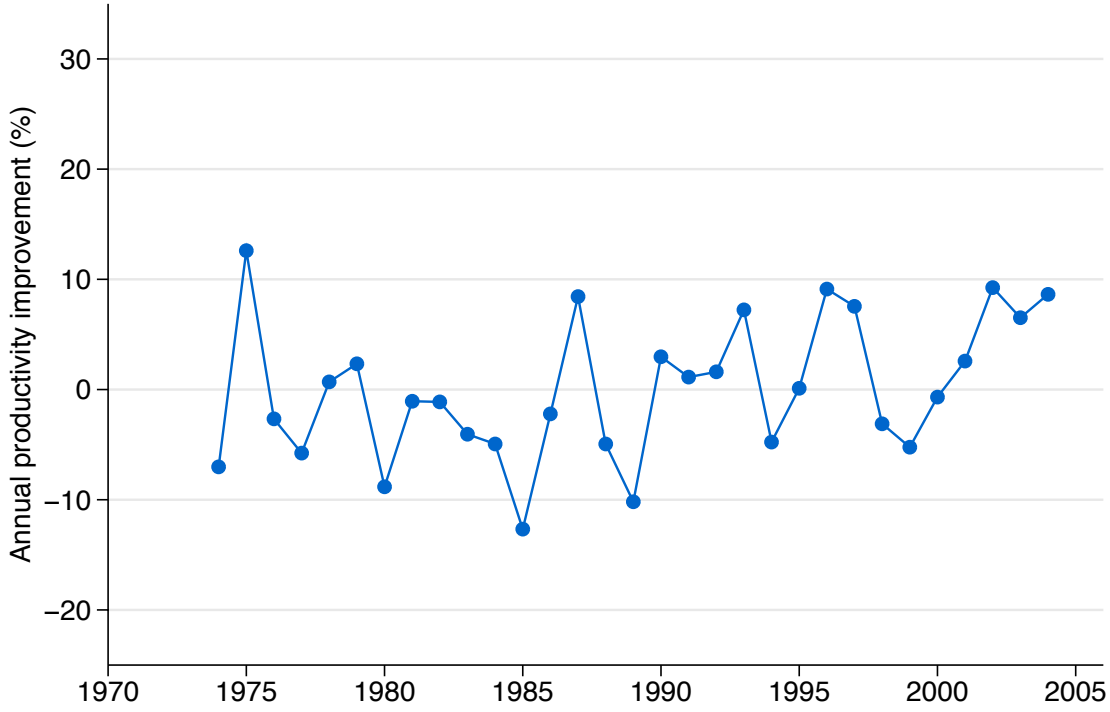
4.14 The charts over the new few pages show how our chosen measure of productivity improvement has varied from year to year in each of our chosen comparator sectors:

Figure 3 Annual capital-adjusted productivity growth for construction



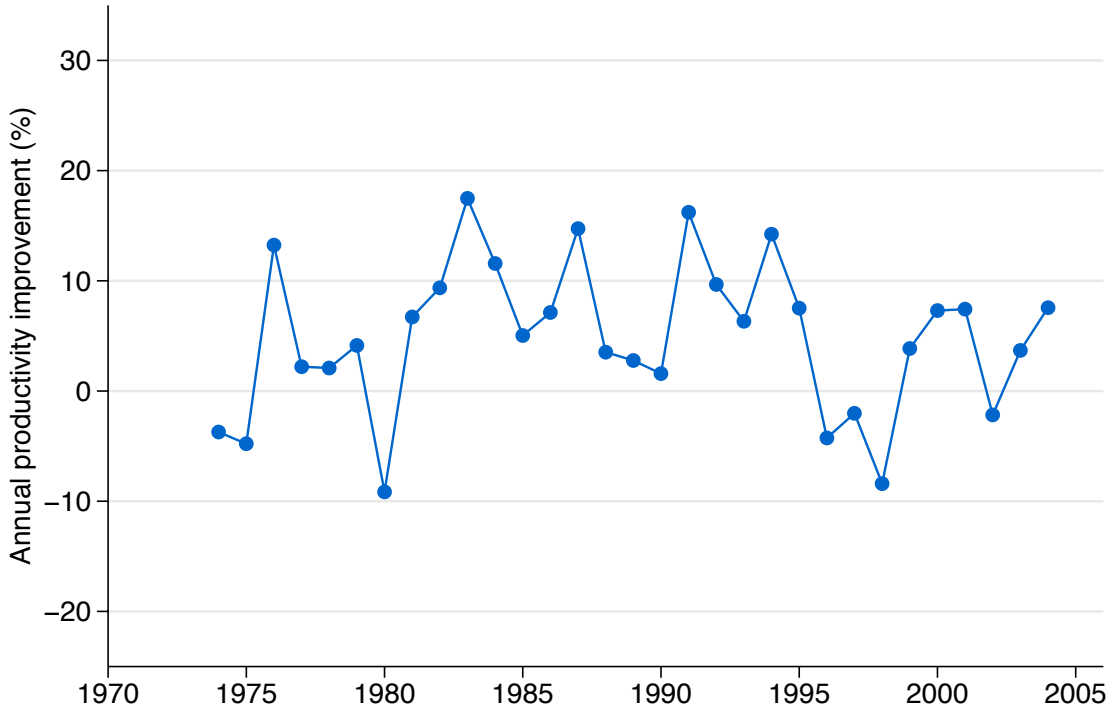
Source: Reckon analysis of EU KLEMS data

Figure 4 Annual capital-adjusted productivity growth for financial intermediation



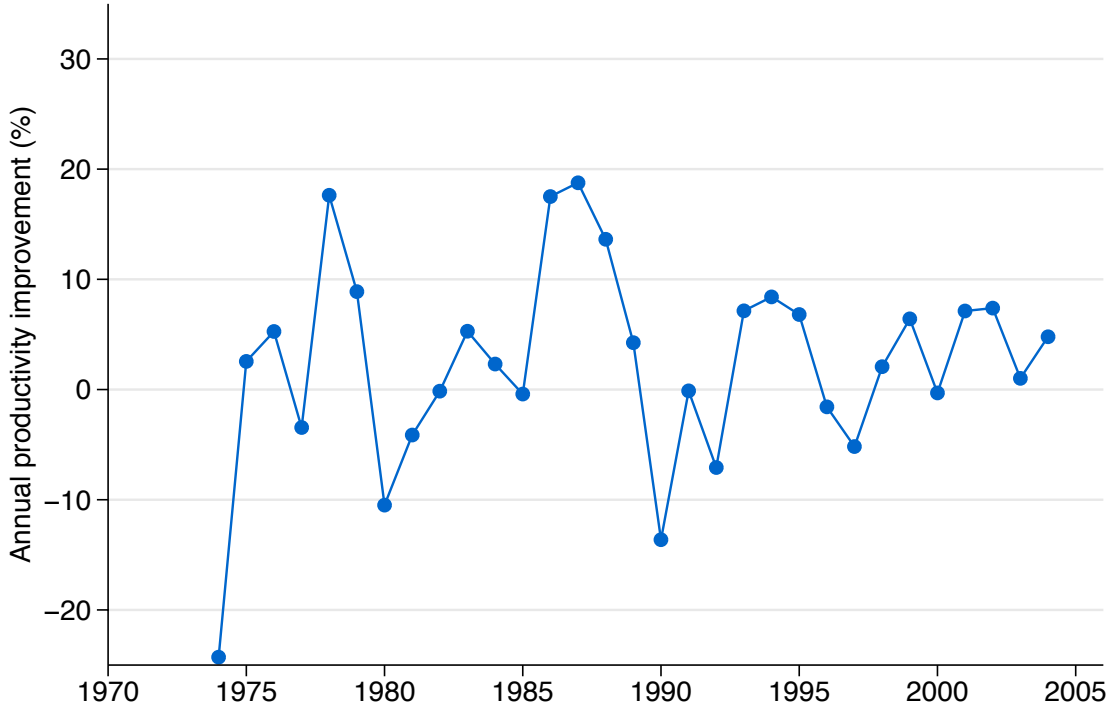
Source: Reckon analysis of EU KLEMS data

Figure 5 Annual capital-adjusted productivity growth for manufacture of chemicals, chemical products and man-made fibres



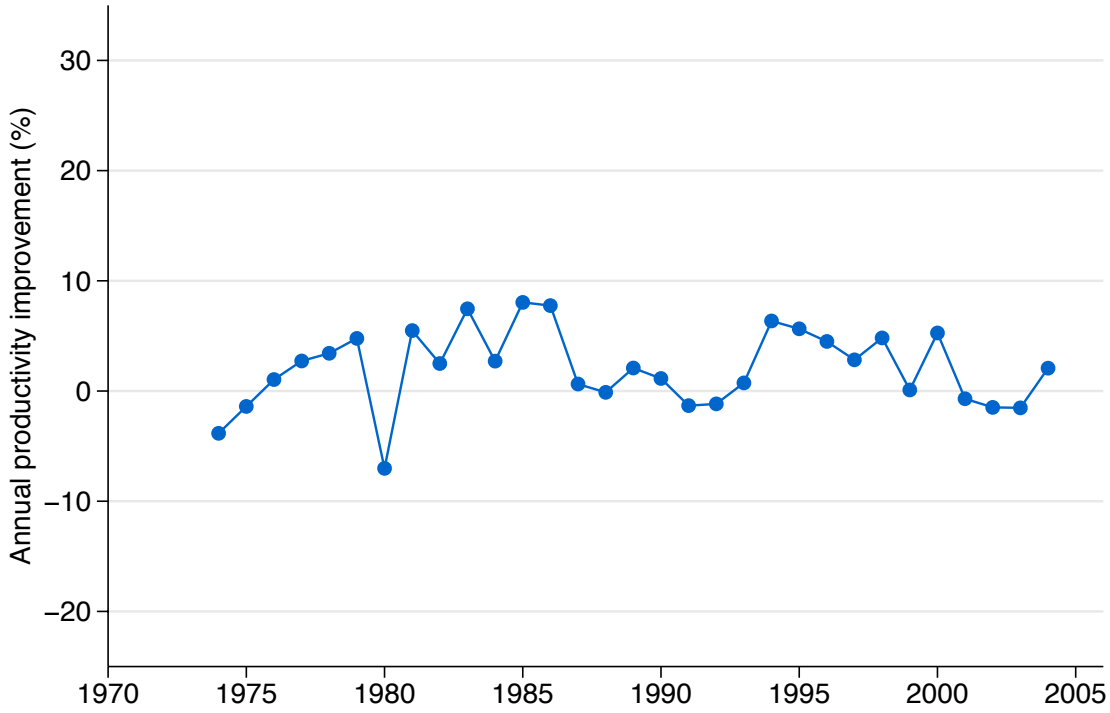
Source: Reckon analysis of EU KLEMS data

Figure 6 Annual capital-adjusted productivity growth for sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel



Source: Reckon analysis of EU KLEMS data

Figure 7 Annual capital-adjusted productivity growth for transport and storage



Source: Reckon analysis of EU KLEMS data

Definitions, sources and methods

4.15 This section defines of the concepts of productivity growth that we use in this report, and outlines the data sources and methods that we have used to estimate the figures reported above.

Rationale for estimating measures of productivity growth

4.16 Europe Economics (2007) relies on labour-and-capital multifactor productivity growth as its main measure, and focuses specifically on differences between sectoral productivity growth and whole-economy productivity growth.

4.17 This focus is justified by an assumption linking whole-economy productivity growth to input price trends, and an implicit assumption that imports can be disregarded.

4.18 For the reasons explained in First Economics (2007) and in our review of that paper in Section 2, we do not think that these assumptions can safely be relied upon.

4.19 On that basis, we have agreed with Ofgem that our work should focus on productivity measures, leaving assumptions about input price trends relative to the RPI to be made by Ofgem using separate evidence.

Sources of productivity data

4.20 The results reported in Europe Economics (2007) are based on the UK part of the NISEC02 dataset published by the NIESR in 2002.

4.21 The main relevant elements of the NISEC02 dataset are:

a) Sectoral indices of volumes of labour and capital inputs.

b) Sectoral estimates of the share of value added accounted for by labour.

c) Sectoral estimates of labour-and-capital multifactor productivity, where output is measured by a value added volume measure taken from the UK national accounts.

4.22 The NISEC02 dataset covers the period 1950 to 1999 but Europe Economics (2007) focuses its analysis on the period 1973–1999 for reasons given at paragraph 4.51.

4.23 The data above are available at the level of some individual sectors as well as for the economy as a whole. The sectors used in NISEC02 follow an ad hoc classification.

4.24 For this update, we have used the EU KLEMS dataset, published in March 2007. The EU KLEMS dataset updates and extends previous work by the NIESR and the University of Groningen. It uses the NACE industrial classification and covers the period 1970–2004.

Value added measures of productivity growth

4.25 The concept of volume growth in value added seeks to capture the idea that growth in the volume of output from an industry can be decomposed into a component attributable to additional use of energy, materials and services, and the rest being attributed to greater or more productive use of labour and capital and treated as volume growth in value added.

4.26 A measure of volume growth in value added is reported in the UK national accounts as value added at constant prices. Another measure can be inferred from output and input volumes by using the following formula:

$$g(GO) = shareVA_{GO} * g(VA) + (1 - shareVA_{GO}) * g(II)$$

where

g(GO) is volume growth for gross output

g(VA) is volume growth for value added

g(II) is volume growth for intermediate inputs

$shareVA_{GO}$ is the share of the value of gross output which is accounted for by value added

4.27 Value added comprises capital and labour, and nothing else. Thus, from a volume measure of value added, a measure of total factor productivity is defined by the following formula:

$$g(TFP_{VA}) = g(VA) - shareK_{VA} * g(K) - shareL_{VA} * g(L)$$

where

$g(TFP_{VA})$ is the value added total factor productivity growth measure

$g(K)$ is the growth in the volume of capital

$g(L)$ is the growth in the volume of labour

$shareK_{VA}$ is the share of capital in value added

$shareL_{VA}$ is the share of labour in value added (i.e. $1 - shareK_{VA}$)

4.28 In order to use productivity data from comparator sectors to estimate a trend for operating expenditure in gas distribution, an adjustment is necessary to ensure consistency between the operating expenditure and capital expenditure assumptions made in the price control review. The natural choice is to assume a constant volume and quality of capital: this assumes that replacement expenditure projections are such as to maintain the capability of the asset base, and that specific adjustments are made for any planned improvements or deteriorations of the assets. On that basis, labour productivity trends for the comparator sectors need to be adjusted to assume a constant level of output and capital input. These assumptions are required so that a link can be drawn between productivity improvements and reductions in operating expenditure at a constant level of output and capital input. Such a trend can then feed into the price control assumptions.

4.29 The formula used to calculate labour productivity growth adjusted for the effect of capital substitution is:

$$g(LP_{VAadj}) = g(TFPI_{VA}) / shareL_{VA}$$

where

$g(TFPI_{VA})$ is the value added total factor productivity growth measure obtained from the TFP index included in the EU KLEMS dataset.

4.30 Labour productivity based on value added as a measure of output and adjusted for the effect of growth in capital input is only relevant if Ofgem uses an index for input prices based primarily on wages, with perhaps an allowance for imports, raw energy sources or raw materials — but not for intermediate inputs.

4.31 Furthermore, the relevant comparator industries if using a productivity measure based on value added are the activities comparable to operating a gas distribution network *and all upstream activities from that*. This is because the analysis considers the productivity of the supply chain as a whole as a mechanism for converting inputs (primarily labour) into the operation and maintenance of a gas distribution network.

4.32 As far as we can understand, Europe Economics (2007) relies on measures of labour and capital productivity based on value added as a measure of output, so that it appears to imply the approaches described above. This hypothesis is compatible with the assumption at paragraphs 4.71–4.72 of Europe Economics (2007) that labour represents two thirds of the inputs in the economy as a whole. Europe Economics' 0.4 per cent input price adjustment is consistent with the assumption that the relevant input price basket to use in making operating expenditure projections comprises primarily labour, and therefore that the relevant input price trend is faster than inflation in total labour and capital input prices in the economy as a whole.

4.33 We have briefly considered the possibility of using measures of productivity that are not based on a value added concept, but instead measure the improvement in the rate at which a combination of labour, capital and intermediate inputs (energy, materials and services) is converted into gross outputs in different sectors of the economy. The EU KLEMS dataset includes some volume growth series for gross output and intermediate inputs, which could in principle be used for that purpose. However, our initial investigation found significant unexplained discrepancies between these data and the EU KLEMS data on value added volume measures. As the value added volume measures are based on standard ONS data series which have been examined and used by many researchers, we consider them likely to give more reliable indicators of productivity growth than the new intermediate input and gross output volume data series constructed by the EU KLEMS project.

4.34 The effects of industry restructuring provide a possible reason why the intermediate input and gross output volume data series might be unsuitable (without further adjustment) to construct indicators of productivity growth. For example, a vertical separation within a supply chain could increase gross output and intermediate inputs by recognising an additional transaction in the national accounts, but would not by itself change value added or labour and capital inputs. Such a change, especially if it happens as a one-off (rather than slowly over a period of time) would distort gross output measures of productivity, but would not affect value added measures.

4.35 Understanding and correcting these issues with the gross output and intermediate input data, even if feasible, would have gone beyond the scope of our work. On that basis, we only report data for value added measures of productivity improvement. If Ofgem decides to combine a productivity improvement assumption with input price trends for a basket of direct labour and intermediate inputs used by gas distribution networks, then it may need to take account of differences between the labour input price trend and input price trends for the mix of labour and intermediate inputs. This would ensure consistency between our capital-adjusted labour productivity figures and such an approach to input prices.