



## Labour Productivity Measures from the Annual Business Inquiry

Chris Daffin  
Productivity Branch  
Office for National Statistics  
Email: [chris.daffin@ons.gov.uk](mailto:chris.daffin@ons.gov.uk)

Eunice Lau  
Productivity and Social Economics Branch  
Office for National Statistics  
Email: [eunice.lau@ons.gov.uk](mailto:eunice.lau@ons.gov.uk)

### Introduction

Between 1998 and 2001 the Office for National Statistics (ONS) introduced a new survey, the Annual Business Inquiry (ABI). This survey has several advantages over its predecessors as it brings together accounting and employment data in the same survey and also it uses common statistical methodology in the estimation process (Jones, 2000). These changes have greatly improved the consistency between output and labour measures making the compilation of detailed labour productivity measures feasible. This article takes a look at such measures, in particular noting the issues involved.

Current quarterly measures of labour productivity are published for certain industries of the Standard Industrial Classification (Revised 1992) (SIC92). Indices for the whole economy, production, manufacturing, and manufacturing sub-sections are also published. In addition experimental data are published for sections G/H, (SIC92 industry divisions 50-55, Distribution, Hotels and Catering combined) and for G-P (SIC92 industry divisions 50-95, Services combined). These use the ratio of indices of Gross Value Added (GVA) to indices of employment. The GVA measure is that produced by the National Accounts system, at constant 1995 basic prices. The employee part of the employment measures uses data compiled from Short Term Employment Surveys (STES). These quarterly employee jobs data are benchmarked onto the annual ABI employee jobs results. The GVA and employment measures used for compiling productivity data therefore have a basis in the ABI, but the consistency of the two measures is diminished due to adjustments made by National Accounts to the value added for coherence (balancing). While indices of productivity allow for the comparison over time of a particular industry, value levels of productivity are needed to make comparisons between industries. Value data on GVA are available from the Current Price Input Output (CPIO) data, but again their consistency with the employment data is diminished through the National Accounts adjustments.

A user consultation process was recently undertaken as preparation for a strategy for productivity development within ONS (Lau, 2002). The consultation noted user demands for more detailed data on productivity, in particular for the services industries as well as for levels of productivity in order to facilitate comparisons between industries.

In June 2002 ONS released estimates of approximate gross value added and other data from the 2000 ABI/2 inquiry, and has recently added year average employment numbers to the available data. While these data enable users to calculate a current price labour productivity measure to the 4-digit SIC92 level by simply dividing the two series there are still issues that users should be aware of.

### Data Issues

The GVA measures compiled from the ABI are approximate as the full range of variables necessary to calculate the true GVA is not available and the estimates differ from Input-Output final numbers. Adjustments are made to the Input-Output data to account for differences in coverage, concepts and valuation. For these reasons any GVA per job measures compiled from the ABI will also be approximate.

Industries where the approximate GVA per job data are considered to be too misleading are therefore not published.

For these reasons the approximate GVA per job data for certain industries should be treated with caution. In particular for the following industries:

- SIC92 industry division 70, GVA is not an appropriate measure for this sector as it excludes capital expenditure. Approximate GVA per job figures are therefore not published for this industry.
- SIC92 industry divisions 73, 91.1 and 91.3 are affected by the exclusion of grants. This can result in negative GVA data for parts of these industries.
- SIC92 industry divisions 80 and 85, the approximate GVA per job data for sections M and N are much lower than the average, for two reasons. Firstly the coverage is different because the part of the ABI that collects turnover data does not go out to public bodies in health or education. Secondly for the part of the private sector that is covered by the ABI, grants received from Government are not included, resulting in some negative GVAs. GVA per job figures are therefore not published for these industries.
- The ABI does not collect turnover data for SIC92 industry divisions 65 to 67 and 75, although SIC92 industry divisions 65 to 67 are now starting to be covered. Turnover data for SIC92 divisions 2 and 5 have been collected since 2000, but are not included in this article. Hence no GVA data are available for these industries. Due to disclosure issues, GVA data for some SIC92 industry divisions at the 4-digit level are also not published. However, the missing data are included in the aggregated SIC92 section for these industries.
- The productivity data for SIC92 sections involving tobacco and alcohol (SIC92 industry divisions 15.9, 16, 51.3) should be treated with caution due to reporting issues. The GVA estimates for these industries can be volatile, as they are particularly affected by the timing of the release of goods from bonded warehouses in order to minimise duty payments. This can be seen in SIC92 industry division 51.35-51.37 where the productivity values range from 6.5 in 1998 through 117.3 in 1999 to 37.5 in 2000. For industries that involve oil and gas (SIC92 industry division 23.2) there is also a reporting issue as a business can change the point at which it reports paying duty, so one year the duty will appear in wholesale and the next in refining.

The problem of reclassification of the industry to which data are assigned between one year and the next, noted above for SIC92 division 23.2, is a general problem that can affect other industries. While ONS does manage these changes so as to minimise differences between years care needs to be exercised in comparing data between years for some industries.

The denominator used in the calculation of approximate GVA per job is the year average employment data. These data are calculated by adjusting the annual December point in time ABI employee data by quarterly STES employee data. While this loses some of the consistency between the numerator and denominator data, the year average data is still preferred, in particular as any seasonality is removed.

### **Pre ABI data**

GVA data are published from 1995 while employment data that are consistent with the GVA measure are only available from 1998. Between 1995 and 1998 employee data were collected by the Annual Employment Survey (AES). While AES employee data exist from 1995 there are several differences between the AES and ABI data. There is a known difference in level between the AES and ABI data for 1998 that has been dealt with by scaling the AES data using factors derived from the overlapping 1998 data sets. (Partington, 2001) In addition the primary ABI employment outputs are produced according to the SIC of the local unit, and the AES results were produced in the same way. However, unlike the AES, the ABI results are also available according to the SIC of the reporting unit. This is completely consistent with the classification approach taken for financial variables, and means that GVA per head estimates can now be derived with confidence. Given the differences between the AES and ABI employee data in terms of methodology, SIC coding and level and the importance of maintaining consistency between the output and labour data, the AES data are not used to compile productivity measures prior to 1998.

## Future work

ABI GVA is at current prices. In order to compare different years the data need to be deflated. A similar problem is being looked at by the Business Data Linking Project (BDLP) (see Barnes et al, 2002 for an introduction to the BDLP) in the context of the Annual Respondents Database. The deflation used to date by the BDLP has been relatively simple. In particular, Producer Price Indices (PPI) output deflators (at 2, 3 or 4-digit level) have been used directly to deflate both total output and value added. This single deflation method makes a very strong assumption: that the share of intermediate inputs in total output is relatively stable. This method was used primarily to get at some fairly quick results on the basis that it would be a reasonable approximation, which is more likely to be the case for shorter periods. In addition some analysis has been done on the basis of Multi Factor Productivity where total output, intermediates and capital are used and deflated separately. Future work of the BDLP will include looking at these deflation issues in more detail, primarily through implementing double deflation. In addition it is planned to use the work done in the Constant Price Input Output (KPIO) with regard to the completeness of deflators as the PPIs exclude export prices. The stability of the relationship between intermediates and gross output will also be examined. As this work progresses and results are made available the usefulness in the construction of a constant price productivity measure can be assessed.

The ABI does not collect data on hours worked and therefore there is no measure of total hours worked that has the same consistency with the GVA measure as there is for the employment measure. It is possible to construct an approximate GVA per hour measure using average hours from either the Labour Force Survey (LFS) or the New Earnings Survey (NES). Actual or paid hours data are available from the LFS while only paid hours are available from the NES. Work is being done to look at the feasibility of constructing a hours measure based on employer survey data as part of the Labour Cost Index feasibility study and this may be used to improve existing published productivity measures. However, it is unlikely that this work will lead to the compilation of GVA per hour worked measures from the ABI as the consistency obtained by collecting output and labour measures from the same survey would be lost.

## Analysis of the results for 1998-2000

At present, the available approximate GVA per job figures from the ABI are at current prices, and allow comparisons of productivity level across sectors, although not across time. This additional information complements the published official series on productivity growth. Furthermore, the sectoral breakdown from the ABI is more comprehensive than that of the quarterly productivity series, especially in the service sector, offering some insight into the dominant sector of the economy where information about its productivity performance has so far been relatively sparse. This is not to say that the ABI offers all the answers that we are looking for about the service sector. As outlined above, among other things, financial intermediation (section J) and public administration (Section L) are not covered and data collected on education and health (sections M and N) do not give representative estimates of their productivity performance.

**Table 1A: ABI Approximate GVA per job at current prices, £ thousand**

SIC92 Section	Description	1998	1999	2000
C-O*	All sections covered by ABI	28.8	30.3	31.3
C-E	Production sector	38.6	40.4	43.2
C-F	Production sector plus construction	36.1	38.0	40.2
G-O*	Service sector	25.3	26.8	27.4

\*Excludes sections J, L, M, N and SIC92 70

**Table 1B: ABI Approximate GVA per job at current prices, All sectors (C-O\*) = 1.00**

SIC92 Section	Description	1998	1999	2000
C-O*	All sections covered by ABI	1.00	1.00	1.00
C-E	Production sector	1.34	1.33	1.38
C-F	Production sector plus construction	1.25	1.25	1.28
G-O*	Service sector	0.88	0.88	0.88

\*Excludes sections J, L, M, N and SIC92 70

The service sector is generally believed to have lower labour productivity, both in terms of level and growth, than the production sector. This is because traditionally services tend to be more labour intensive and less apt than the production sector in adopting technological advancement. (However this may be changing with the advancement in information and communications technologies which are as relevant to the service sector as to the production sector, having the potential to transform the production process and widen the product range.) Table 1A which presents the results of approximate GVA per job at current prices based on the ABI by broad sector, appears to lend support to this general perception. The service sector does seem to be systematically falling behind the production sector in terms of productivity performance. Table 1B shows that services achieved only around 88% of the average productivity of all sectors, compared with more than 130% achieved by the production sector. This is not surprising when, among other things, real productivity growth in services (all sectors from Sections G-Q) has been lower than in the production sector in the past two decades except for a brief period in 1995-1998 (see chart 1).

**Chart 1: Average annual real growth rates of output per job**

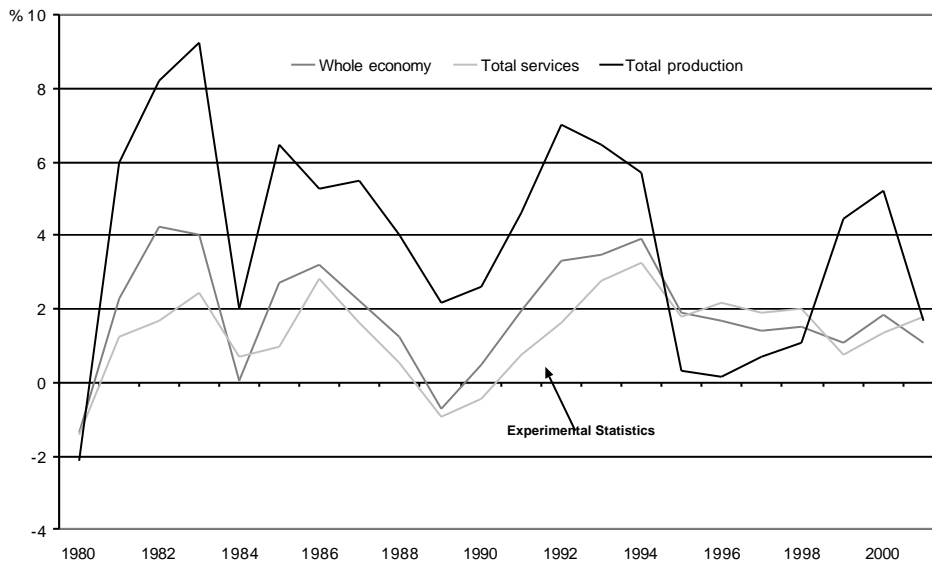


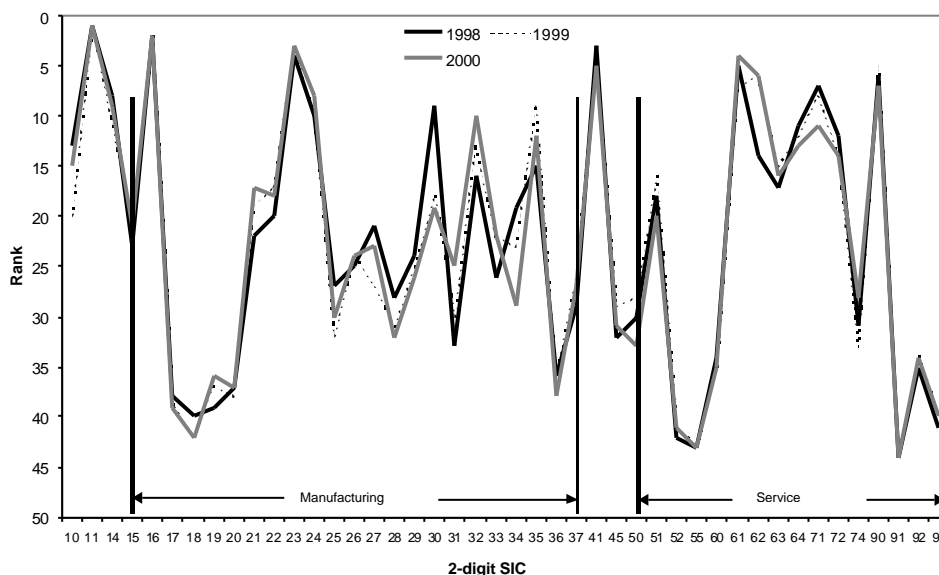
Table 2 shows that the service sector (G-O excluding J, L, M, N and SIC92 70) provided around three times as many jobs as the production sector but managed only to deliver less than twice as much approximate GVA. Consequently, service sector labour productivity is about two-thirds that of the production sector. It should be noted that this is a labour productivity measure and as such will be affected by different levels of capital intensity in each sector. During the three years studied, there was a displacement of jobs from production, especially in manufacturing, to the service sector. However this had not worsened the labour productivity gap between production and services.

**Table 2: Ratio of service sector (G-O) to production sector (C-E)**

	1998	1999	2000
Employment	2.66	2.84	3.02
Approximate GVA	1.74	1.88	1.91

The comparisons of broad sectors have masked the variation of performance within them. To study that, industry divisions (i.e. up to two-digit SIC) are ranked according to their relative productivity performance in terms of their approximate GVA per job at current prices in descending order from 1 to 46. Chart 2 shows the ranking against industry division for each of the three years between 1998-2000. The production sector is represented by divisions 10 to 41, within which divisions 15 to 37 mark the manufacturing sector. From division 50 onwards demarcates the service sector, whereas division 45 is construction. Chart 2 has excluded division 13 (mining of metal ores) because its 2000 figure is not available but is not very large, and divisions 80 (education) and 85 (health and social work) because these figures are unlikely to be representative, as previously described.

Chart 2 shows that productivity performance varies greatly across sectors and that little change in relative performance occurred during 1998-2000. Industry division 11 (extraction of crude petroleum and natural gas) tops the table for all the three years under concern. However, it should be noted that its approximate GVA per job at current prices is very much affected by the volatile movements in oil prices and that it is a very capital-intensive sector. This most likely explains why approximate GVA per job of division 11 was ten times the median in 1998 rising to twelve times and twenty-one times in 1999 and 2000 respectively. Manufacture of tobacco products (division 16) occupied the second place for all the years between 1998-2000. However, these figures need to be interpreted with care as they may be affected by the treatment of duty, as noted earlier. Consistently scoring high were also division 23 (manufacture of coke, refined petroleum products and nuclear fuel), division 40 (electricity, gas, steam and hot water supply) and division 41 (collection, purification and distribution of water). This probably reflected their much automated and capital intensive production processes.

**Chart 2: Relative productivity performance**

There were a number of high scorers within the service sector too, which were water transport (division 61), renting of machinery and equipment without operator and of personal and household goods (division 71), and sewage and refuse disposal, sanitation and similar activities (division 90). There was a big contrast between wholesale trade (division 51) and retail trade (division 52), with the former hovering just above the median while the latter came close to the bottom. This is not surprising as the retail trade is expected to be labour intensive and this is confirmed by the fact that it was the biggest employer in terms of number of jobs for all the three years studied. That said, as the job count here does not distinguish

between part-time and full-time jobs, the productivity measure used here is very likely to show the retail trade (and for the same reason, hotel and restaurants, division 55) in a less favourable light given that part-time jobs account for a significant proportion of jobs in this particular sector. In June 2002, 59 per cent of jobs in division 55 were part-time, compared to an average of 31 per cent for the whole economy. Industry divisions that occupied the bottom of the rank both came from the service sector: hotel and restaurants (division 55) and activities of membership organisations (division 91). Table 3 shows approximate GVA per job for the key service industries, on which data are available from the ABI.

**Table 3: Approximate GVA per job at current prices for the major service sectors, £ thousand**

SIC division	Description	1998	1999	2000
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	38.5	40.3	38.8
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	14.8	16.4	16.7
55	Hotels and restaurants	11.3	11.9	12.5
Section I	Transport, storage and communication	38.8	40.4	41.0

Table 4 shows that the productivity performance of those ICT-related industry divisions was better than average (with the median rank being 22 or 23). It is interesting to note the change in the relative positions of divisions 30 and 32 during this very short time period. The ranking of the former fell from 10 in 1998 to 20 in 2000 whereas that of the latter improved from 17 to 11.

**Table 4: Productivity performance of industrial subsections handling ICT, ranking**

SIC division	Description	1998	1999	2000
30	Manufacture of office machinery and computers	10	19	20
32	Manufacture of radio, televisions and communication equipment and apparatus	17	14	11
64	Post and telecommunications	12	13	14
71	Renting of machinery and equipment without operator and of personal and household goods	8	9	12
72	Computer and related activities (including hardware and software consultancy)	13	15	15

This analysis demonstrates the potential of the ABI in filling the data gap in labour productivity for the service sector and for more comprehensive industrial breakdown. That said, the currently available ABI data have their limitations that have prevented us from drawing more definitive conclusions beyond the tentative ones presented here. As discussed above, erratic and rapidly changing price movements in specific sectors, like those in the oil industry and computers, could render even comparisons across sectors invalid. Appropriate deflators will be required to allow more meaningful comparisons both across time and across sectors. In addition, there are no data on financial intermediation and public administration and defence, two key service sectors, although the former is starting to be covered by the ABI. Finally, the general difficulty remains in measuring service sector output, where quality matters as much as, if not more than, quantity.

## References

Barnes, M and Martin, R., (2002), "Business Data Linking: An introduction", *Economic Trends*, No 581, 34-41

Jones, G., (2000), "The Development of the Annual Business Inquiry", *Economic Trends*, No 564, 49-57

Lau, E., (2002), "Productivity Measures: ONS Strategy", *Economic Trends*, No 581, 20-25

Partington, J., (2001), "The launch of the Annual Business Inquiry", *Labour Market Trends*, Vol 109, No 5, 259-268