Office for National Statistics

Productivity Handbook

Contact:

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1 . Overview of productivity handbook

The Office for National Statistics (ONS), in response to the needs of UK policy-makers and others who use our data, has produced an expanding range of productivity statistics and analyses in recent years. As government policy has focused more explicitly on measures to increase productivity and output, so the demand for better statistics has grown. Two important reviews of economic statistics, on structural change and regional issues by Christopher Allsopp, and on measurement of government output and productivity by Tony Atkinson, have helped to provide direction.

This investment is raising the quality of UK productivity statistics compared to those produced by other countries. In some areas, such as analysis of the effect of Information Communications Technology (ICT) investment and measurement of public services productivity, we can claim to be among a small group of the world's leading statistics agencies.

The improvements achieved, and those still in the pipeline, cover a wide range of inputs to productivity measurement. So far they have been available in a fragmented form. This ONS Productivity Handbook sets out to present the current position, so that users have a clear appreciation of the changes that have taken place and the challenges being addressed.

This Handbook is not intended as a competitor to the Organisation for Economic Co-operation and Development (OECD) Productivity Manual, which is the authoritative international source on methodology for productivity analysis. Taking the international standards as given, this is the first comprehensive guide to implementation and practice, showing how UK statistics have developed, and are developing, to help a wide range of users in government and beyond.

Productivity is a complex field, and by setting out the sources and uses of productivity statistics in a single publication, the Handbook makes our productivity material more readily accessible and coherent. It also serves to make more users aware of the data resources available and to encourage external input to further improvement.

We are responsible for a relatively small proportion of productivity analysis in the UK, but it provides most of the basic data on which the work of others depends. Productivity estimates usually rely on multiple sources, making it difficult to achieve consistency between the numerator (output) and denominator (input), between countries and regions, and over time. There is also the difficulty of measuring quality change, which affects both output and input. All of these issues are explored in the Handbook.

The ONS Productivity Handbook has been created in collaboration with statisticians and economists in several UK government departments, OECD staff and leading academics. We would like to thank all contributors to this first edition.

2 . Foreword by the National Statistician

I am delighted to welcome you to the ONS Productivity Handbook. This is the first time that information on how all Office for National Statistics (ONS) productivity measures and theories are sourced and formulated has been brought together in one volume. As such, it forms a wonderful resource for anyone working on or studying how productivity is measured and influenced. The content reflects consultation with users of ONS statistics to ensure that it addresses all the important areas and issues within productivity analysis.

Statistics relating to productivity are vital to understanding the economy and how it changes. This, and the impressive range of ONS productivity statistics and analysis, leads to widespread interest in measures published at international, national and regional levels and also for different sections of the economy. This Handbook meets and reflects these interests.

As with all ONS statistics, it is crucial that both experts and the general public can depend on the accuracy and relevance of ONS productivity measures. I believe that the clarity, completeness and accessibility of this volume will enhance this confidence. Additionally, by laying out our plans for further work in this area, this publication encourages future input from all users.

Together with the online version, the ONS Productivity Handbook should be the ideal reference source for everyone who uses ONS productivity measures to gain insight into the UK economy and its place in the world in the 21st century. I hope you will enjoy reading it.

Karen Dunnell

National Statistician

3 . Introduction to Productivity Handbook

What is productivity, how is it measured and why is it important?

These questions are a useful starting point from which we can define and explain the range of productivity measures we produce.

Productivity represents the relationships between inputs and outputs in the production process. As a practical concept, productivity helps define both the scope for raising living standards and the competitiveness of an economy. Productivity has, therefore, an increasing role in formulating and assessing government policy.

This introductory chapter provides a definition of productivity along with an explanation of how and why it is used. It also covers the importance of productivity as an economic measure. Giving broad definitions of output and input, and the challenges in measuring productivity, it goes on to explain the difference between levels and growth rates of productivity. Finally, the chapter outlines different measures of productivity, their uses and the links between them.

4 . ONS framework for productivity

Policy-users outside the Office for National Statistics (ONS) monitor productivity for the UK, its industries and regions through analysis based on ONS National Statistics data. A framework for our productivity outputs must therefore include the statistical building blocks for these expert external users, as well as analysis that we publish.

The framework outlined in this chapter has 2 main purposes. First, it describes ONS productivity outputs (both data and analysis) and streams of work more clearly. Second, it sets out ways of assessing the consistency and completeness of our productivity outputs in a way that can help form judgements on priorities to improve their coherence.

Presentation of the framework is in 2 parts. It begins with a description of levels within the economy at which productivity outputs are delivered and why those levels are used. It goes on to set out a summary of economic and labour market statistics required by users to analyse policy and evaluate productivity outcomes, where possible being consistent with national accounts.

5 . Productivity theory and drivers

Measuring aggregate productivity accurately and consistently is an important objective for a National Statistical Institute (NSI). Users, however, also want to look behind the statistics to understand the dynamics and determinants of productivity growth.

Increasing productivity is generally considered to be the only sustainable way of improving living standards in the long term. Statistical evidence to help policy-makers understand the routes to productivity growth, especially those that can be influenced by government, can help lead to better policy.

This chapter introduces the main determinants, or "drivers", of productivity growth. It then explains how productivity statistics can be compiled and presented in a way that helps illuminate some of the important determinants. In particular, this chapter gives details of the growth accounting framework that decomposes economic growth into the contributions of capital, labour and other inputs. It does this both for the economy as a whole and for sectors of industry.

6 . Output measures: UK national accounts

Productivity measures are constructed from output and input data. This chapter focuses on output measures produced within the UK national accounts. The basic framework of the UK national accounts is provided alongside an explanation of how they are constructed.

A detailed description of gross domestic product (GDP) is given and compared with gross value added (GVA). As part of this, the 3 approaches to measuring GDP (income, output and expenditure) are explained and compared, as are the processes used to generate measures of output.

This chapter also outlines the input-output supply and use tables as they are produced in the UK and how they are used as a framework to reconcile the 3 different approaches to measuring GDP. The industry analysis produced through the supply and use framework provides the important output data to work on productivity for a range of users.

7 . Input measures: labour and capital

Consistency within productivity estimates, for both labour and multi-factor measures, is of primary importance and requires coherent output and input data. For labour productivity, this means labour input, workers, jobs or hours worked and for multi-factor productivity (MFP) this means both labour and capital inputs. These inputs are quality-adjusted labour input (QALI) measures and the volume index of capital services (VICS).

QALI measures not only hours worked as labour's input into production but also approximates workers' marginal productivity, using their characteristics to adjust hours worked. VICS captures the flow of services that stem from the physical capital stock and are used in the production process, taking account of changes in the mix of assets and their useful value. By taking account of known improvements in inputs, these measures produce more accurate estimates of productivity growth.

This chapter reviews current methodologies and considers the importance of consistency within productivity estimates and the challenges that this provides. The chapter describes how we ensure that coherent output and input measures are available. Specific attention is paid to our work to reconcile the estimates of labour input.

The chapter also describes the 2 new inputs we have developed for calculations – QALI and VICS.

8 . Quality adjustment

In order to reflect changes in real values of inputs and outputs, measures of productivity should take quality changes in both into account. This is usually achieved by ensuring that the price indices used for deflation are adjusted for these quality changes. At the most basic level, volume measures are regarded as a combination of quantity and quality.

This chapter discusses the principles of quality adjustment, the practical issues encountered in quality adjustment within the market sector side and the limits these impose on productivity measures. It also considers how these principles can be applied when considering productivity in government services.

The main focus here is on quality adjustments to output measures, but the principles apply equally to inputs.

9 . Market sector, services and industries

The increasing use of productivity growth assessments for monetary and fiscal policy has led to demands for more information on the competitive sectors of the economy.

In 2005, we developed experimental measures of market sector output and, from March 2007, began publishing experimental estimates of market sector productivity.

The growing importance of the service sector across the last 30 years has also been a wide-reaching economic development. The complexities in measuring a service-dominated economy rather than a manufacturing one have proved challenging. Therefore identifying the main issues and their efforts has been a central concern.

The first section in this chapter details these market sector measures and provides results for recent years. It also comments on how market sector and public services fit together. The chapter continues by considering the measurement of the service sector; in particular, it focuses on those issues affecting measurement of output.

The chapter concludes with a section on productivity by industry, showing details of what is available and explaining important issues for users of these data.

10 . Public service productivity

Public service output covers both central and local government output, and in most developed economies accounts for a significant share of total Gross Domestic Product (GDP). In the UK, the public sector is just over a fifth of total GDP in expenditure terms. An accurate and realistic representation of the contribution made by the public sector to overall GDP and productivity is therefore very important, simply because of its size.

A reinforcing reason for better measurement of public service output, inputs and productivity is public accountability. Public expenditure is financed largely by taxation, and taxpayers have an interest in how the government uses the proceeds from their tax payments. Similarly, users have a right to information about the quantity and quality of the services they are being offered. The performance of public services is therefore of interest to tax payers, to those who use the services and to those who provide the services, as well as for the government to assess the success of its performance agenda.

This chapter sets out guidelines for measuring public service productivity: the measurement of non-market government output and of government expenditure on the inputs used to produce the output. Similar to the market sector, public service productivity is defined as the ratio of outputs to inputs.

Productivity growth is the change in this ratio over time. All public services productivity measurement is multi-factor productivity measurement. It should be noted that while significant progress has been made in measuring public service productivity, it is still a developing area and we will be consulting with experts and practitioners at various stages of this development.

11 . Micro, or firm-level, productivity

All our productivity outputs – whole economy, sector or industry level series – are constructed from data for individual firms collected through our surveys. Since 1995, information technology has made it possible to look behind the overall figures to understand better how they are driven by the performance of individual firms. This is valuable in developing statistical evidence for the design and assessment of policy.

Most of our business surveys are carried out under the Statistics of Trade Act 1947, which makes completion of the survey compulsory but limits the use to statistical purposes. A programme to develop micro-data access began in 1997, and one to link micro-data from different surveys began in 2001.

Since 2004, we have provided secure access to confidential micro-data for statistical research through a "virtual micro-data laboratory" (VML) facility. This VML provides useful research access to this data, for statistical analysis by accredited experts. Analysis of individual survey returns, rather than macro-level statistics, has enabled these researchers to look at individual drivers of productivity.

This chapter describes the VML, and the use and policy impact of micro productivity work. It gives an overview of the data sets and information currently available to researchers while maintaining security.

12 . Regional productivity

Regional differences in productivity performance across the UK are seen by government as important policy targets. For a number of years, government objectives have been set not only in terms of improving UK productivity performance against other countries but also in creating conditions to allow less productive regions to reduce the "gap" between themselves and the most productive.

This chapter discusses the issues surrounding the measurement of productivity at a regional level. It introduces the uses and importance of regional statistics before describing regional productivity in terms of the historical and current measures available. Clarification is provided about what the different measures show – whether they describe economic performance, welfare or productivity – and the effect that using different measures can have.

Some of the factors that explain differences in the productivity of regions are identified, with discussion of the issues surrounding data capability and availability at the regional level. The chapter finishes with discussion of future development plans, with particular reference to the recommendations made to better satisfy the pressing needs for improved regional data that were highlighted in the Review of Statistics for Economic Policy-making (Allsopp, 2004).

13 . International comparisons of productivity

Designed to be consistent across countries, international comparisons of productivity are measures that allow the UK economy's performance to be assessed against both that of other nations and domestic objectives. This is particularly of interest to the Department of Trade and Industry (DTI) and HM Treasury (HMT), which assess these series when determining the UK's progress against their Public Service Agreement productivity target. Understanding how international comparisons of productivity are estimated is important when considering what progress is being made.

This is an area in which the Organisation for Economic Co-operation and Development (OECD) also carries out a great deal of work. OECD compiles productivity statistics for member countries to monitor economic performance, analyse labour and product market rigidities, and generally use productivity as an input to econometric models and forecasting.

This chapter discusses the various international comparisons of productivity, their purpose and limitations. It includes a section provided by the OECD that gives their perspective on productivity comparisons. The chapter ends with a description of the ongoing EU KLEMS (Capital, Labour, Energy, Materials and Services) project, which aims to produce an international growth accounts database for European Union (EU) countries. This section provides background to the project, some interim results and discusses future work.

14 . The way forward for productivity statistics

UK productivity statistics, and the measures provided by usto support productivity assessments by users, have made significant strides over recent years. Some of the newer developments have been outlined in earlier chapters, but users – and the changing economy – continue to place new demands.

A significant challenge for productivity measurement is responding to structural changes in the economy. This can fundamentally affect the interpretation of productivity analysis, according to research into new forms of investment. In addition, the development programme for measurement of public sector output and productivity has been taking shape through a UK-wide consultation exercise. We also help to influence international standards in this area.

This chapter outlines our ongoing work to improve the consistency of input and output measures in a number of areas. Within the market sector this includes covering how better measures of labour input by industry are being created and also details of our work to improve definition of new types of capital.

This chapter also describes how our will continue to promote the development of international measurement standards to reflect change but remains committed to producing its productivity outputs to agreed international definitions. In particular, this chapter includes details of future plans within ONS to improve measures of services within the public sector.

15 . Productivity Handbook Glossary

Many of the terms used in the ONS Productivity Handbook are specific to productivity theory, labour market statistics or national accounts terminology.

These include, for example, "capital deepening" and "double deflation".

Others are specific to the Office for National Statistics or government in general, such as abbreviations for the different government departments.

This section provides a listing of these terms and, where they have an abbreviated form, includes this as well as the long form.

The glossary is presented in alphabetical order to assist readers dealing with unfamiliar words.