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The Mayor of London established GLA Economics in May 2002 to provide a firm statistical, factual and forecasting basis for policy decision-making by the GLA group. GLA Economics is funded by Transport for London (TfL), the London Development Agency (LDA) and the Greater London Authority (GLA).

# Foreword

Maintaining international competitiveness requires cities to adopt a relentlessly outward looking approach. This provides city authorities with some challenges, not least being able to measure city performance and identify where our activities are making an impact. The London Development Agency (LDA) wants to ensure that the international comparisons used to benchmark London's performance against its competitor cities are robust.

The LDA welcomed the opportunity to work in partnership with GLA Economics on this research. The project has emphasised the importance of consistency and standardisation in collection and measurement of city data. It has also highlighted the need for transparency in the analysis process. In view of these principle findings, the LDA encourages the wide dissemination of this report.

The next steps for this project are twofold. First, this research focused on European city data only, which provided an ideal test bed for assessing progress towards our objectives of attaining a comparable, continuous and robust dataset. The LDA is now keen to extend this work to benchmarking London against other world cities.

Secondly, the LDA is keen to promote a wider understanding of the mechanics of undertaking international comparisons to support economic development practitioners in internationalizing their programmes. To this end the LDA will be producing a how-to guide that summarises the findings of the Measuring Cities process and offers tips for practical adoption.

**Patrick McVeigh**
Head of European and International Affairs
London Development Agency

# Contents

## Executive summary

*Working Paper 9: Measuring and Comparing World Cities* studies the economic performance of a shortlist of 27 cities, as estimated by seven sources. It finds that estimates of even the most basic indicators, such as the level of and growth in productivity, diverge so much that no estimate can be relied on. It explains why.

This situation has led GLA Economics produce a benchmark dataset which specifies output, employment and productivity for 27 cities. It derives these indicators from standardised geographical definitions and harmonised data published by Eurostat. The dataset will serve as a reference for the GLA group and will be used to compare and assess data commissioned from other private and official sources.

This working paper outlines a procedure to extend this dataset to a wider range of cities and indicators. It also specifies a framework for the GLA group to use when commissioning further data on cities.

# Introduction

GLA Economics, in conjunction with the London Development Agency (LDA), undertook a study of city economic indicators in early October 2003. It was agreed that the study should seek a comparable, continuous and robust dataset, defined as follows:

- *Comparable* data means that the same indicator, for two different cities, should measure as far as is possible the same underlying property of the city.
- *Continuous* data means that indicators are available (and comparable) at different points in time so that processes of change may be studied.
- *Robust* data means data that does not vary with its source or the method of data collection or transformation.

In the time available, the study had to be limited to a small pilot set of indicators and cities. A group of European cities were chosen because, as a result of European harmonisation, a growing amount of European regional data is available from the official agency, Eurostat, which has been prepared on a consistent basis.

For similar reasons, a limited group of suppliers was chosen who were known to have data products including a substantial number of cities within the pilot group.

It was agreed to proceed in two stages. The first stage provided a verified minimum set of indicators for a shortlist of 27 cities, with which to study the scope of the problems.

Over time, this will be extended to a larger dataset covering a representative sample of cities worldwide, and to a larger set of indicators. The LDA expects to invite tenders for this purpose. This working paper presents an initial assessment of the stage 1 findings, a methodology for selecting further cities and further indicators for study, and some guidelines for procurement and for the provision of data to the Greater London Authority (GLA) group.[1]

The principal difficulty encountered was that the differences between suppliers' estimates were large. If these differences could not be explained, then meaningful conclusions about the cities could not be drawn. For example, when comparing two cities, did the conclusions reflect the real status of the cities or the assumptions and methods of the suppliers?

The purpose of this working paper is to shed light on why suppliers differ. It aims to make clear the underlying assumptions that lead to different estimates of the same indicator. The GLA group will then be better placed to ensure that data it commissions is prepared on the basis of a common standard, and to make clear the assumptions that underlie any conclusions that might be drawn from it.

The working paper concludes with a set of guidelines for commissioning further data about cities. The guidelines are designed to ensure that this data conforms to the GLA's standard assumptions or, if it differs from this standard, is supplied in conjunctions with a clear statement of the assumptions leading to the difference.

[1] The GLA group includes the Greater London Authority, Transport for London, the London Development Agency, the Metropolitan Police Authority and the London Fire and Emergency Planning Authority.

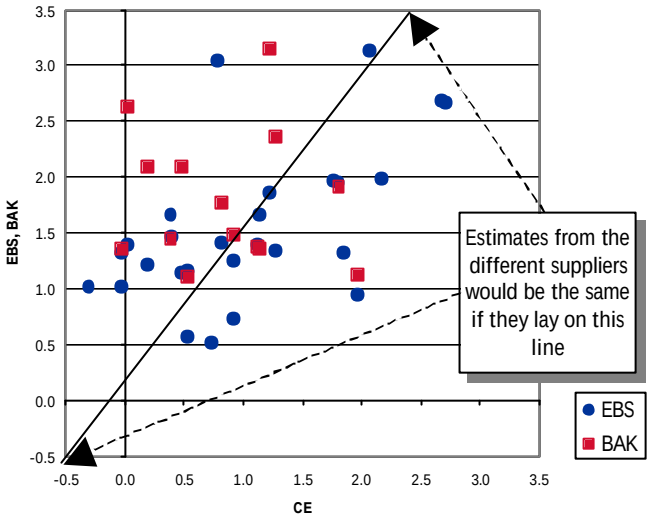
# 1. Data risk: why standards matter

The economic performance of cities can be compared by finding out which city's productivity is growing fastest. Using Frankfurt and Lisbon as an example, Table 1 shows the largest and smallest estimates of annual growth rates from a shortlist of 27 European cities selected for this study. The table was constructed from employment and output data supplied to GLA Economics by three providers. [2]

**Table 1. Annual productivity growth of Frankfurt and Lisbon, estimated from figures from three providers**

| City | Largest estimate % | Smallest estimate % |
|---|---|---|
| Frankfurt | 2.62 | 0.03 |
| Lisbon | 3.04 | 0.79 |

**Chart 1. Reported annual productivity growth from three principal sources, compared**




*Source: See footnote 2*
*Note: CE (horizontal axis) 1990-2001 average*
*EBS (vertical axis) 1991-2001 average*
*BAK (vertical axis) 1991-2001 average*

The differences between the largest and the smallest estimates, at 2.6 percentage points for Frankfurt and 2.2 percentage points for Lisbon, are as large or greater than the differences between the cities themselves. Moreover, if this divergence between suppliers is taken as an indicator of the range of potential error, the error is as almost as great as what is being measured.

According to the worst estimate of Frankfurt's annual productivity growth (0.03 per cent) and the best estimate of Lisbon's (3.04 per cent), Lisbon is a hundred times better. But using

[2] Sources of data referred to in this report are abbreviated as follows (a full list of acronyms can be found in Appendix C):
EBS: Experian Business Strategies as supplied to the Core Cities project (Parkinson 2003).
CE: Cambridge Econometrics as published to clients of its European Economic Prospects service.
BAK: BAK Basel (International Benchmark Club)
GEMACA/LSE: Estimates for Functional Urban Regions supplied by Professor Paul Cheshire from the London School of Economics and by the GEMACA (Group for European Metropolitan Areas Comparative Analysis) project.
GAME: Grans Aglomeracions Metropolitanes Europees – estimates of Greater Metropolitan Areas supplied by Professor Cheshire and produced by the Institut d'Estudis Metropolitans de Barcelona, based on agglomerations of urbanised areas.
UA: Urban Audit City data collected and disseminated by Eurostat
Data from the Globalisation and World Cities (GaWC) research study were also consulted.

the best estimate for Frankfurt (2.62 per cent) and the worst for Lisbon (0.79 per cent), Frankfurt is performing nearly four times better.

This is a general problem. Charts 1 and 2, and Table 2, show the range of variation in the estimates of annual productivity growth reported by sources who provided the GLA with productivity data for the cities in its shortlist.[3]

**Table 2. Average annual productivity growth in the 1990s**

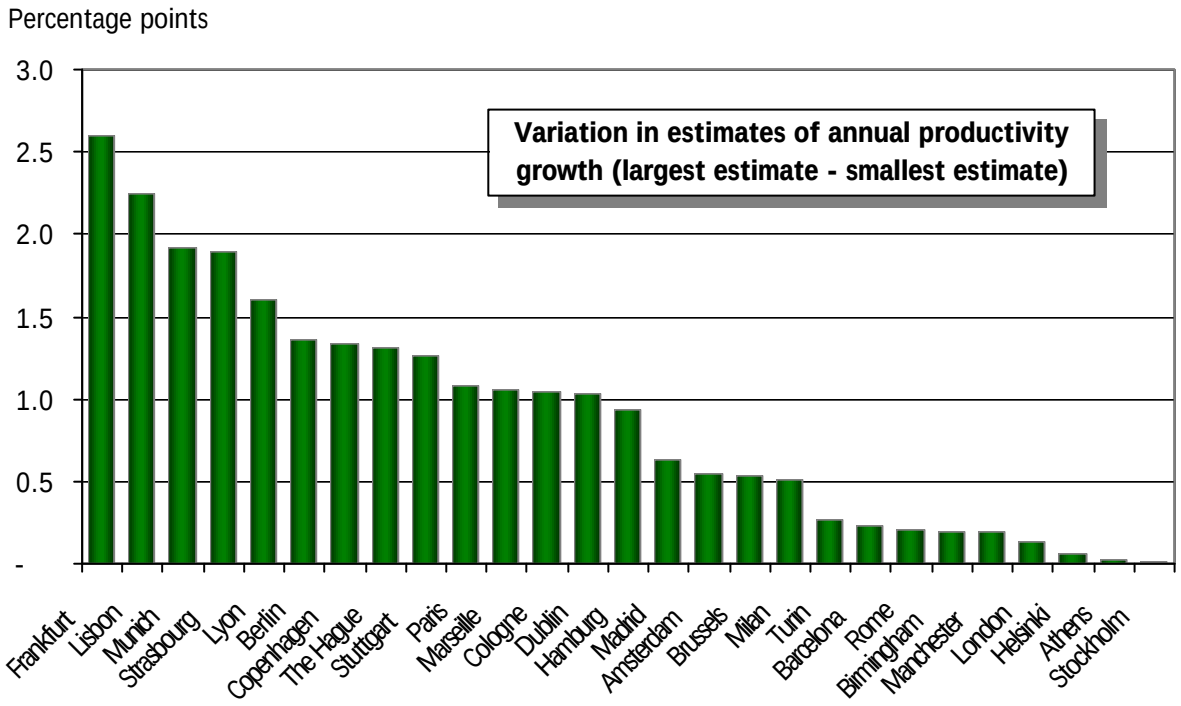
| | Growth rates (%) | | | Largest estimate – smallest estimate | Rankings | | |
|---|---|---|---|---|---|---|---|
| GLA Name | CE | EBS | BAK | | CE rank | EBS rank | BAK rank |
| **Frankfurt** | 0.03 | 1.38 | 2.62 | 2.59 | 24 | 14 | 2 |
| **Lisbon** | 0.79 | 3.04 | | 2.25 | 16 | 2 | |
| **Munich** | 1.23 | 1.85 | 3.15 | 1.92 | 10 | 8 | 1 |
| **Strasbourg** | 0.20 | 1.21 | 2.09 | 1.89 | 23 | 19 | 4 |
| **Lyon** | 0.49 | 1.13 | 2.09 | 1.60 | 20 | 21 | 5 |
| **Berlin** | - 0.02 | 1.00 | 1.35 | 1.36 | 25 | 23 | 12 |
| **Copenhagen** | - 0.02 | 1.32 | | 1.34 | 26 | 16 | |
| **The Hague** | - 0.30 | 1.01 | | 1.31 | 27 | 22 | |
| **Stuttgart** | 0.39 | 1.65 | 1.45 | 1.26 | 22 | 10 | 9 |
| **Paris** | 1.27 | 1.34 | 2.36 | 1.08 | 9 | 15 | 3 |
| **Marseille** | 0.40 | 1.45 | | 1.05 | 21 | 11 | |
| **Cologne** | 1.98 | 0.94 | 1.12 | 1.04 | 5 | 24 | 13 |
| **Dublin** | 2.08 | 3.12 | | 1.04 | 4 | 1 | |
| **Hamburg** | 0.83 | 1.41 | 1.76 | 0.94 | 15 | 12 | 7 |
| **Madrid** | 0.53 | 1.16 | 1.09 | 0.63 | 19 | 20 | 14 |
| **Amsterdam** | 0.93 | 1.24 | 1.47 | 0.55 | 14 | 18 | 8 |
| **Brussels** | 1.85 | 1.32 | | 0.54 | 6 | 17 | |
| **Milan** | 1.14 | 1.65 | 1.36 | 0.51 | 11 | 9 | 11 |
| **Turin** | 1.13 | 1.40 | 1.37 | 0.27 | 12 | 13 | 10 |
| **Barcelona** | 0.74 | 0.51 | | 0.23 | 17 | 27 | |
| **Rome** | 0.93 | 0.72 | | 0.21 | 13 | 25 | |
| **Birmingham** | 2.17 | 1.98 | | 0.19 | 3 | 5 | |
| **Manchester** | 1.78 | 1.97 | | 0.19 | 8 | 6 | |
| **London** | 1.81 | 1.95 | 1.91 | 0.14 | 7 | 7 | 6 |
| **Helsinki** | 2.72 | 2.66 | | 0.06 | 1 | 4 | |
| **Athens** | 0.54 | 0.56 | | 0.02 | 18 | 26 | |
| **Stockholm** | 2.68 | 2.68 | | 0.01 | 2 | 3 | |

[3] As with Table 1 and Chart 1, growth rates are annual averages from 1990-2001 (CE) and for 1991-2001 (EBS, BAK). These periods are the closest comparators for the data.

Statistical analysis suggests that the differences between suppliers are highly significant. The average difference between suppliers is six times greater than the average difference between cities; the probability that this could have arisen by chance alone is 0.5 per cent.[4]

Estimates from different suppliers vary so much that no single usable authoritative standard exists. Unless it can be established that one source of information is definitively better than another, the risk of making a mistake because of measurement differences in the data is greater than any risk arising from the real world. Analysis and policies cannot be based on this data with any degree of confidence.

**Chart 2. Range of variation in productivity growth rates over the past decade, from three principal sources**[5]




A solution might be to choose one particular set of estimates having judged that the method used to produce it is superior. However, there is no obvious such choice. The problem does not arise because suppliers provide faulty data: to the contrary, it arises because they strive, from the standpoint of what they regard as correct practice, to provide the highest possible quality data. The problem is that they each take a different view of what is correct practice. In short, the problem is that there are no standards.

Economic data about countries respects international standards such as the System of National Accounts. Comparisons can be made between, for example, the output of Germany and the output of the UK with some degree of confidence that like is being compared with

[4] The analysis used a single-factor analysis of variance; the Mean Sum of Squares deviation between suppliers is 35, and within suppliers 6.1. A standard F-test rejects the null hypothesis that the deviation between suppliers is not significant with a probability of 0.005.

[5] CE: 1990-2000; EBS: 1991-2001; BAK: 1990-2001

like. However, such a standard does not exist for cities. This introduces *data risk* – the risk that judgements are based on data that does not support them.

The purpose of this report is to reduce this data risk by finding out why estimates of the same thing vary so much.

Its first aim is to make explicit the assumptions that lead to the numbers. Then, when one estimate is chosen over another, planners and the public can understand on what underlying assumptions their decisions depend. Its second aim is to isolate causes of variation from each other, so that each can be corrected for individually, should the need arise. Its third aim is to facilitate harmonisation. If suppliers and official agencies understand why their estimates differ so widely, then the difference between them can be reduced by agreeing common standards and criteria.

### 1.1 How bad is the problem?

Productivity is increasingly the principal target of regional policy and is regarded as a basic indicator of economic health. It was identified as a key target for Regional Development Agencies in the 2003 and 2004 budgets (HM Treasury 2003, 2004). The Office of the Deputy Prime Minister's report on Core Cities explicitly extended the approach of targeting regional productivity to cities, and produced detailed productivity comparisons between British and other European Cities (Parkinson et al 2004). Measuring productivity correctly is critical to effective policy.

It is also a summary indicator which reflects a data supplier's view of the main factors that economists try to measure: the size and definition of the city itself, the number of people who work there, and the output they produce. So if productivity estimates differ, it is because all these basic indicators are also estimated differently. While there is a small possibility that the problem is confined to productivity alone, the difficulties with productivity are a signal that there is a much more widespread problem of city data measurement in general.

It could be that the problem is confined to a small number of cities which might be treated as special cases. The evidence, however, suggests that the problem is more widespread. As can be seen from Table 2:

- The variation between estimates of productivity growth is greater than 1 percentage point for 13 of the 27 cities in the test dataset. The highest estimate of productivity growth is around three per cent, suggesting a very high level of variation.
- Berlin, The Hague and Copenhagen are shown as having negative productivity growth by one provider, and positive growth by the others.
- The ranking is also supplier-dependent. For example, CE growth estimates are higher than EBS for Barcelona, Birmingham, Brussels, Cologne, Helsinki, Rome, and Stockholm, but lower than EBS for all others. Frankfurt is ranked second by BAK and twenty-fourth by CE.

- There is some consistency for the very highest productivity growth cities – Dublin, Stockholm and Helsinki are in the top three for both CE and EBS[6], but there is no similar agreement at the low end. Lyon, which is ranked fifteenth by CE, is ranked fourth by EBS.
- Even for the British cities selected, the estimates differ to such an extent that Birmingham is ranked higher than Manchester by EBS, but Manchester is ranked above Birmingham by CE.

However, productivity growth is derived from absolute productivity, which is in turn derived from output and employment. There is a need to be equally cautious in the absence of further information about these underlying indicators.

[6] Though in reverse order.

# 2. Why estimates differ

## 2.1 What is a city?

Unlike in the US (see Appendix A), there is no agreed international or European standard for collecting data on cities. In particular, there is no agreement on where a city's boundaries start or end.

If two suppliers define the same city by placing its boundaries in different places, then in all probability they will provide different measures of what happens in it. They will provide different estimates of its size, the number of people that live there, the work they do, the value it produces, and so on.

This problem extends to many indicators. For example, if Paris is defined to include Disneyland, its tourist revenues will be substantially larger than if it does not. Similarly, if London is considered to include its airports then its visitor numbers will be substantially larger. Such a change might be considered statistically unjustified, but if it is not done then compared to cities with inner-city airports, London will appear to be performing much worse than most authorities would accept as reasonable.

Some indicators are less affected by changes in city definition than others, because they are measured by calculating ratios or growth rates so that the city size appears, in effect, as both denominator and numerator in the same expression. The problem will not be eliminated in this way if a city is structurally different, for example, if highly productive industries are more concentrated in one part of the city than another. In a definition that includes just the productive areas, the city will appear far more productive than in a definition that is wider.

This problem can be seen in the treatment of Birmingham. If it is defined as the NUTS-3 region UKG31,[7] the administrative borough of Birmingham, then its productivity is recorded as £52,600 per employee. On the definition adopted by CE, it can be treated as the region covered by West Midlands Metropolitan County, or NUTS-2 region UKG3, and its productivity is recorded as £30,200 per employee – just over half the narrower Birmingham definition.

This is very relevant in Germany, where differences about how to define cities are particularly great. German cities are often treated as benchmark competitors when judging the performance of British Cities, yet their productivity estimates vary enormously. In terms of productivity growth, BAK ranks Munich first and Frankfurt second, while CE ranks them tenth and twenty-fourth.

[7] NUTS (Nomenclature of Statistical Territorial Units) is the Eurostat standard defining the European regions. NUTS area definitions used by the principal suppliers in this study are included in Appendix B.

The full extent of the problem is visible in Table 3. It gives the areas of the cities in the GLA Economics dataset, including some sources from which productivity estimates were not obtained. It is restricted to cases where suppliers differ. Munich is the most extreme case – the largest estimate of its size is 33 times bigger than the smallest.

**Table 3. City area estimates in square kilometres**

| | Statistical definitions[a] | | | | Functional definitions[a] | | Max/Min (all definitions) |
|---|---|---|---|---|---|---|---|
| **GLA Name** | EBS | CE | BAK | Max/Min | LSE | GAME | |
| **Munich** | 311 | 1,557 | 3,029 | 9.8 | 10,217 | 1,145 | 32.9 |
| **Frankfurt** | 248 | 1,807 | 1,354 | 7.2 | 4,306 | 1,426 | 17.3 |
| **Lisbon** | 11,931 | 2,575 | | 4.6 | 35,597 | 1,305 | 13.8 |
| **Birmingham** | 266 | 899 | | 3.4 | 3,240 | 2,333 | 12.2 |
| **Cologne** | 7,365 | 1,189 | | 6.2 | 3,715 | 6,880 | 5.8 |
| **Amsterdam** | 719 | 718 | 6,888 | 9.6 | 3,002 | 4,135 | 5.8 |
| **Stuttgart** | 1,317 | 3,012 | 825 | 3.7 | 3,655 | 1,042 | 4.4 |

[a] *For an explanation of these terms, see the definitions below*

### 2.2 City Limits: administrative, statistical, and functional definitions

The GEMACA/LSE and GAME datasets introduce a new factor. They attempt to define the city in terms of its *economic* extent. The difficulty with such an approach is that it is often difficult to obtain data if the proposed definition draws boundaries that can be defined only on the basis of very small geographical units. In that case, the boundaries of the correct definition almost always cross the boundaries of regions for which data is readily available, and divide up the areas for which data is supplied by official agencies.[8]

Commercial and official suppliers of data have adopted, more or less pragmatically, definitions that allow them to use official data, generally within the regional data structure defined by Eurostat's NUTS classification (Eurostat 2003).[9]

This leads to a hierarchy of approaches, ranging from economically impeccable but statistically daunting, to solutions that may be statistically simple but are best described economically as erratic. In practice, they shade into each other, forming a kind of continuum.

- **Functional-Analytical**: This approach attempts to capture the economic reality of the city, regardless of whether statistics are readily available or of existing boundaries. One approach measures agglomeration and conceives of the city as a contiguous, densely settled space. The GAME data reflects this approach. The concept of functional urban region (FUR) refines and extends this to include the commuting field – the areas

[8] Subregional data can be imputed from regional data (for example the GLA estimates ward employment by sector from figures on borough employment by sector and ward employment aggregates) by deriving weights derived from such subregional data as are in fact available. Such techniques should ideally be transparent – users of the data need to know what assumptions they have implicitly accepted along with the data. Ideally, they must be able to reproduce the calculation. If the methods are too complex to be reproduced simply, this requirement may be lost.

settled by people who work in the agglomeration. The data supplied by LSE and also in use at the GEMACA project reflects this approach.

- **Statistical-Pragmatic**: In the loosest sense, a city is treated as a continuous space for which statistical data is available. More precisely, it is defined as a collection of contiguous NUTS areas not lower than NUTS-3, containing (in some sense) the city. The statistical concept is to some degree a pragmatic approximation to the concept of functional region, except no attempt is made to establish criteria to determine whether or not a NUTS region should be included in the definition of the city.

- **Administrative-Normative**: this is arguably farthest from the economic reality of the city. It defines the city as the administrative unit which bears its name, for whatever historical reasons. From this point of view, Birmingham should be defined as the borough within the West Midlands conurbation which bears the name Birmingham and Paris is the administrative (NUTS-3) region of Paris. In some cases pragmatism overrides consistency (for example, the City of London).

### 2.3 How much does geography matter?

Amidst this exuberant diversity there is surprising consensus. The statistical suppliers adopted different definitions for only seven of the 27 cities in the shortlist, of which five are in Germany. This allows a first attempt to isolate the effect of these differences by dividing the shortlist in two: those cities where suppliers disagree about the boundaries, and those where they agree. By studying the first set, the impact of geography can be isolated; by studying the second, all other factors can be isolated. Table 4 shows the geographic effect and Table 5 shows the supplier effect.

**Table 4. The geographic effect[a]**

| City[b] | CE city definition % | EBS city definition % | BAK city definition % | Geographic differential[c] % |
|---|---|---|---|---|
| **Munich** | 2.30 | 1.42 | 2.02 | 0.87 |
| **Stuttgart** | 1.99 | 1.80 | 2.47 | 0.67 |
| **Frankfurt** | 0.67 | 0.23 | 0.53 | 0.44 |
| **Cologne** | -0.97 | -0.59 | -0.59 | 0.38 |
| **Amsterdam** | 0.63 | 0.63 | 0.96 | 0.33 |
| **Lisbon** | 2.51 | 2.40 | - | 0.10 |

*[a] Productivity growth for cities that are defined differently by suppliers, using standardised (Eurostat) measures of employment and output for the supplier's city definition. Growth rates are annual averages as follows: CE 1995-2001, all others 1995-2000*

*[b] Birmingham is omitted from this comparison because the relevant Eurostat data is not available*

*[c] Geographic differential = largest estimate – smallest estimate*

**Table 5. The supplier effect[a]**

| City | CE % | EBS % | BAK % | Supplier differential[b] |
|---|---|---|---|---|
| **Lyon** | 0.00 | 1.98 | 0.93 | 1.98 |
| **Copenhagen** | -0.52 | 1.01 | | 1.53 |
| **Barcelona** | 0.59 | -0.93 | | 1.52 |
| **Hamburg** | 2.10 | 1.99 | 0.82 | 1.27 |
| **The Hague** | 0.53 | 1.76 | | 1.23 |
| **Marseille** | 0.00 | 1.22 | | 1.22 |
| **Madrid** | 1.63 | 0.42 | 0.44 | 1.21 |
| **Paris** | 1.36 | 1.74 | 0.54 | 1.20 |
| **Dublin** | 5.00 | 3.80 | | 1.20 |
| **Strasbourg** | 0.00 | 1.08 | 1.12 | 1.12 |
| **Milan** | 0.50 | 1.38 | 0.68 | 0.88 |
| **Athens** | 1.53 | 0.69 | | 0.84 |
| **Berlin** | -0.04 | -0.39 | 0.40 | 0.80 |
| **Brussels** | 2.21 | 1.46 | | 0.76 |
| **Stockholm** | 3.89 | 3.20 | | 0.69 |
| **London** | 1.09 | 1.00 | 0.55 | 0.54 |
| **Manchester** | 1.28 | 0.91 | | 0.37 |
| **Helsinki** | 2.90 | 2.69 | | 0.21 |
| **Turin** | 0.71 | 0.72 | 0.80 | 0.09 |
| **Rome** | 0.51 | 0.44 | | 0.07 |

[a] *Productivity growth for cities that are defined identically by suppliers, using the suppliers' own estimates of productivity growth. Growth rates are annual averages as follows: CE 1995-2001, all others 1995-2000*
[b] *Supplier differential = largest estimate – smallest estimate*

The sample size was too small to apply statistical methods to differentiate the geographical and supplier effects, so a different procedure was used. To isolate the geographic effect, standardised productivity estimates were constructed by applying official Eurostat statistics on output and employment to the city definitions used by the suppliers. All figures in Table 4 use identical measures of employment and productivity, and differ only in the city definitions. The only possible source of divergence are the geographic differences between suppliers. Table 5, on the other hand, contains only those cities for which suppliers agree on the geographical definition, and use the suppliers' own estimates of productivity growth. Since in Table 5 the city boundaries are the same for all suppliers, the only possible source of variation in this table is the way in which they estimate productivity.

The geographic effect is significant. Differences arising from boundary definitions alone are as great as 0.87 percentage point in the case of Munich; this is between a half (using the lowest estimate) and a third (using the highest) of Munich's actual productivity growth, which means it introduces an error between 30 and 50 per cent of the quantity being measured.

However, geography is not the only cause of difference. For ten of the 20 cities in which the geographic definition is identical, estimates of productivity diverge by more than 0.9 percentage points. The average divergence is 0.94 percentage points. It appears that a major reason for differences between estimates of city productivity growth is not just that cities are defined differently, but that productivity is defined differently.

Although the supplier effect is larger than the geographic effect, the geographic effect cannot be ignored. In particular:

- Productivity, which is a ratio of two magnitudes, reduces scale effects. Absolute magnitudes such as total population, total gross value added (GVA), or total employment are much more dramatically affected by city size, as shown by Tables 3 and 6.
- Studying growth rates, as opposed to absolute levels of productivity, reduces the impact of scale factors even further. The absolute productivity levels from suppliers diverge much more markedly than their growth rates.
- In studying productivity growth, a quantity for which the geographic effect is arguably the smallest possible has been chosen from the range of indicators that could have been selected. Yet, even in this case, the choice of city boundary can affect the result by as much as 50 per cent of the magnitude that is itself being estimated

For virtually all important indicators – particularly those dealing with any absolute magnitudes (eg total employment, total output) – it is imperative to control for the effect of variation in city definition.

However, the results suggest that because the statistical-pragmatic approach is an attempt to approximate the functional approach within the limits of existing regional statistics, there may be ways to obtain the benefits of more consistent, fully functional-analytical methods while avoiding some of their complexity.

### 2.4 May contain NUTS: Urban audit

Urban Audit, a Eurostat-led project, is the first *de facto* official standard. It aims to provide data on 333 indicators for 258 cities in the newly expanded 25-member European Union. The first stage, Urban Audit I, was a pilot project which started in 1997 and was published in 1999. Following its success, Urban Audit II was launched in 2002 and the results are being published over the first half of 2004. Urban Audit provides data at more than one spatial level for each city (up to five for London). Data are required for:

- the city (as defined by the local authority/unitary authority boundary in the UK)
- the Larger Urban Zone, a functional area that takes into account commuting into the city[10]
- the sub-city districts, which are the areas that make up the city (wards in the UK).

[10] The Larger Urban Zone of Urban Audit II replaced the earlier Urban Audit I concept of Wider Territorial Unit, which corresponded more closely to the urban agglomeration of the city.

The significance of the Urban Audit approach is best judged by looking at what is arguably the most basic economic fact about a city: who lives there? Table 5 lists the populations of the full range of cities from the full set of suppliers.

The new standard appears, unfortunately, to add significantly to the already wide diversity. Its city level definitions are at the bottom end of the scale of population estimates in every case except for Lyon, Strasbourg, Brussels and Berlin. As a result, variation among estimates is increased. Among other points, it should be noted that there are seven estimates of population for Stuttgart, and the largest is 4.6 times the smallest. Manchester is the most extreme case – the largest estimate of population is 17 times the smallest.

The Urban Audit city level figures thus represent the narrowest application of the administrative concept. However, its Wider Territorial Zone figures match the estimates from the statistical-pragmatic suppliers fairly closely.

**Table 6. City population estimates from the full range of suppliers (millions of inhabitants)**

| | Administrative - Normative | Statistical-Pragmatic | | | | Functional-Analytical | | Summary | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Urban Audit II | CE | EBS | BAK | Urban Audit I WTU | LSE / GEMACA | GAME | Max | Min | Max / Min |
| Manchester | 0.4 | 2.6 | 2.5 | | 2.6 | 1.9 | 6.8 | 6.8 | 0.4 | 17.4 |
| Cologne | 1.0 | 1.6 | 4.3 | 2.2 | | 2.2 | 10.3 | 10.3 | 1.0 | 10.7 |
| Amsterdam | 0.7 | 1.2 | 1.2 | 7.1 | | 2.6 | 6.2 | 7.1 | 0.7 | 9.7 |
| Milan | 1.2 | 3.8 | 3.7 | 3.7 | 3.5 | 3.8 | 6.1 | 9.1 | 1.2 | 7.7 |
| Lisbon | 0.6 | 2.6 | 3.3 | | 1.6 | 4.1 | 2.3 | 4.1 | 0.6 | 7.3 |
| Stuttgart | | 2.4 | 4.0 | 1.0 | 0.9 | 2.6 | 1.6 | 4.0 | 0.9 | 4.6 |
| Paris | 2.1 | 11.1 | 11.3 | 11.1 | | 10.9 | 10.0 | 11.3 | 2.1 | 5.3 |
| Athens | 0.7 | 3.8 | 3.5 | | 3.5 | 3.5 | | 3.8 | 0.7 | 5.1 |
| Lyon | 1.2 | 1.6 | 1.6 | 1.6 | 1.1 | 2.0 | 1.3 | 2.0 | 1.1 | 1.8 |
| Strasbourg | 0.5 | 1.0 | 1.0 | 1.0 | 0.4 | 1.0 | | 1.0 | 0.4 | 2.5 |
| Copenhagen | 0.5 | 0.6 | 0.6 | | 1.2 | 1.9 | 1.3 | 1.9 | 0.5 | 3.9 |
| Frankfurt | 0.6 | 1.9 | 0.6 | 1.5 | 2.5 | 2.5 | 2.2 | 2.5 | 0.6 | 3.9 |
| Birmingham | 1.0 | 2.6 | 1.0 | | 2.6 | 2.9 | 3.8 | 3.8 | 1.0 | 3.8 |
| Brussels | 1.0 | 1.0 | 0.9 | | | 3.5 | 2.8 | 3.5 | 0.9 | 3.7 |
| Munich | 1.2 | 1.6 | 1.2 | 2.8 | | 2.9 | 1.8 | 4.0 | 1.2 | 3.4 |
| Dublin | 0.5 | 1.1 | 1.1 | | 1.1 | 1.6 | | 1.6 | 0.5 | 3.2 |
| The Hague | 0.4 | 0.7 | 0.7 | | | 1.4 | | 1.4 | 0.4 | 3.2 |
| Barcelona | 1.5 | 4.7 | 4.6 | | 2.9 | 4.6 | 4.1 | 4.7 | 1.5 | 3.1 |
| Turin | 0.9 | 2.2 | 2.2 | 2.2 | | 2.0 | 1.7 | 2.2 | 0.9 | 2.6 |
| Helsinki | 0.6 | 1.2 | 1.4 | | 0.9 | | | 1.4 | 0.6 | 2.5 |
| Stockholm | 0.8 | 1.8 | 1.8 | | 1.2 | 1.8 | 1.3 | 1.8 | 0.8 | 2.4 |
| Marseille | 1.3 | 1.9 | 1.9 | | 1.0 | 1.5 | 1.2 | 1.9 | 1.0 | 1.9 |
| Rome | 2.5 | 3.9 | 3.8 | | | 3.9 | 3.3 | 5.3 | 2.5 | 2.1 |
| Madrid | 2.9 | 5.2 | 5.1 | 5.5 | 4.4 | 5.2 | 4.7 | 5.5 | 2.9 | 1.9 |
| Berlin | 3.4 | 3.4 | 3.4 | 3.4 | | 2.1 | 4.0 | 4.0 | 2.1 | 1.9 |
| Hamburg | 1.7 | 1.7 | 1.7 | 1.7 | | 3.1 | 2.2 | 3.1 | 1.7 | 1.8 |
| London | 7.2 | 7.3 | 7.2 | 7.2 | | 9.2 | 12.7 | 12.7 | 7.2 | 1.8 |

### 2.5 Is a standard possible?

The difficulties in producing a standard city definition arise from two sources. In the first place, they arise because there is no clear European standard for where a city begins or ends. But secondly, they arise because Europe's regions (which are the subject of a standard, defined by an European Economic Community regulation) are already a compromise between statistical consistency and the historically existing boundaries in the countries concerned. The Urban Audit website explains its choice of units as follows:

> Cities have generally been defined as the central municipality which is responsible for local government. In most countries, the city corresponds to the concept of local administrative unit (LAU) level 2 (formerly NUTS level 5) … Given that the structure of local government varies a lot between EU countries, the result is a city concept that is not always comparable between countries. The emphasis has been on identifying a city concept with political responsibility in the various countries.

Eurostat's *Guide to Regional Statistics* (Eurostat 2003) explains in turn how it chooses the NUTS regions into which Europe is classified for statistical purposes:

> Two types of regional division are usually recognised:
>
> **Normative** regions reflect political will; their boundaries are fixed in terms of the remit of local authorities and the size of the region's population regarded as corresponding to the economically optimal use of the necessary resources to accomplish their tasks; historical factors may also be at the root of an agreement to maintain the autonomy of certain administrative divisions.
>
> **Analytical (or functional)** regions are defined in terms of analytical requirements; they categorise elementary areas according to geographical criteria such as altitude or soil type, or by economic and social criteria such as the homogeneity, complementarity or polarisation of regional economics.
>
> As their name suggests, analytical or functional regions are useful primarily for economic analysis. Some divisions (employment or infrastructure catchment areas, etc.) are already delineated and used in some countries. Harmonised application of the rules for defining these regions would provide international comparability, and the division itself (the map) is an interesting item of information even without all the additional statistics available. Unfortunately, there are as many potential divisions as there are subjects for analysis.
>
> For practical reasons of data availability and regional policy implementation, the NUTS classification is accordingly based largely on the institutional divisions applied in the Member States (normative criterion)

As the Eurostat guide accepts, analytical classifications are more suited to economic analysis. But the NUTS boundaries are chosen primarily on normative criteria. Within a classification

already slewed away from analytical criteria, as Urban Audit acknowledges, the regions selected to represent a city are determined by political and historical tradition, rather than economic reality. Finally, since almost all cities grow, some very rapidly,[11] the older the administrative boundary, the less likely that it will coincide with the economic reality of the city.

This does not mean that the Urban Audit data is in error, but that its purpose does not coincide with the GLA's. For political reasons it is obviously vital that a body (such as the government of Paris) with responsibility for controlling what happens inside a specific administrative unit, should be fully informed about what is happening in that unit, as should its voters. The problem is that this unit does not coincide with the boundaries of the real city in economic terms, and is likely to be quite different from it. This is because political boundaries generally change very slowly in comparison to the underlying economic reality. Therefore, administratively based data is usually least useful when comparing economic performance, because it corresponds to economic entities that have long ceased to exist.

[11] And if they were not growing, at least in terms of output and employment, then according to most standards of economic analysis they would normally be judged uncompetitive and economically unsuccessful.

# 3. What is productivity?

## 3.1 Productivity and its components

Section 2.3 suggests that the geographical effect of differences in city definition, although not negligible, may be outweighed by differences between estimates of productivity. In a sense this is an even more serious issue, since it affects evaluations of the performance, not just of cities, but also of regions and countries. It shows the need for caution in dealing with measures of productivity. The rest of this working paper takes a brief look at the impact of the assumptions underlying the suppliers' measures of productivity and its components.

Setting aside the more complicated idea of total factor productivity, productivity is the quantity of output divided by the amount of labour that produced it. This leaves plenty of scope for diversity. The denominator can be the number of hours worked, or the number of jobs (number of posts), or the number of employees.[12] It can include part-time workers or not; it can include the self-employed or not.

The numerator is even more problematic because there are no official constant price or real estimates of output for cities. Current price estimates exist but suppliers disagree about how to deflate these in order to produce estimates of real output. In particular there is a strong argument that city output should not be deflated in the same way as country output, because cities have a different industrial structure. As a result, each supplier has attempted to provide, in their view, the best or most appropriate deflator to measure what quantity of output that a city actually produces.

There are two sources of difference between measures of productivity, namely employment and output. Each is considered in turn, using the same general approach followed for productivity.

## 3.2 Measuring employment

Measures of employment are covered by an international standard laid down by the International Labour Organization and a European standard of data collection (the European Labour Force Survey). There is a stronger correspondence between suppliers as Chart 3 shows.

However, the lack of agreement between employment figures is disappointing. To separate the geographic from the supplier component, the same procedure is followed as before. The supplier effect for employment growth is, as with productivity, larger than geographic divergence. It is also quite large, being over one percentage point for 11 cities. Reasons for this difference were listed above. Additional reasons are:

- Eurostat data is not yet updated according to a very definite schedule and therefore suppliers who work to varying schedules of publication find themselves working from different official data.

[12] The number of employees will differ from the number of jobs when some people have more than one job.

- Suppliers may opt to use national data sources, which do not always match Eurostat sources, and to carry out transformations designed to improve data quality, for example, by ensuring that regional totals are constrained to national totals both in aggregate and by sector.

**Chart 3. Growth rates of employment supplied by CE, EBS and BAK**[13]

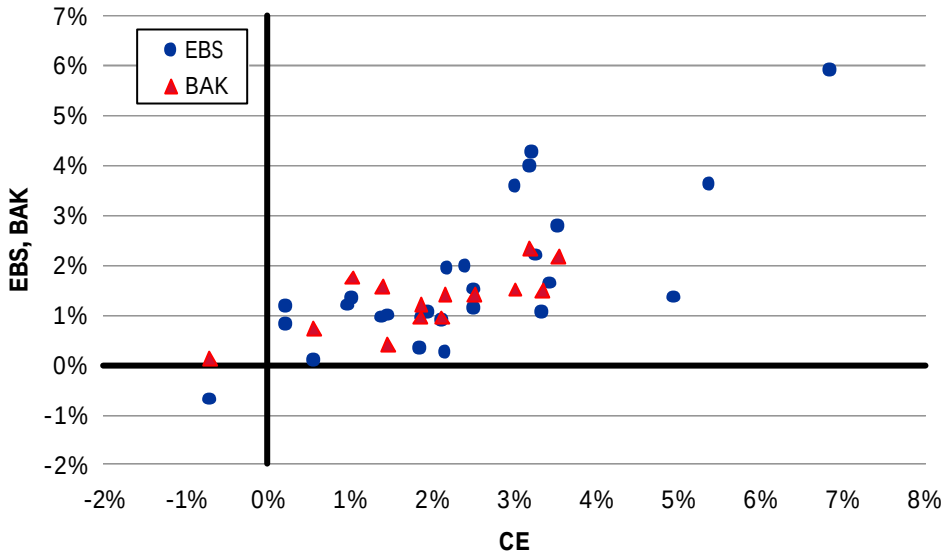



**Table 7. The employment geographic effect**[a]

| City[b] | CE city definition | EBS city definition | BAK city definition | Geographic differential[c] |
|---|---|---|---|---|
| **Amsterdam** | 4.04 | 4.04 | 3.02 | 1.02 |
| **Munich** | 1.31 | 0.76 | 1.37 | 0.62 |
| **Lisbon** | 1.88 | 2.10 | - | 0.21 |
| **Stuttgart** | 0.97 | 1.02 | 1.18 | 0.21 |
| **Cologne** | 2.07 | 1.98 | 1.98 | 0.09 |
| **Frankfurt** | 1.43 | 1.49 | 1.43 | 0.06 |

[a] *Employment growth for cities that are defined differently by suppliers, using standardised (Eurostat) measures of employment for the supplier's city definition. Growth rates are annual averages as follows: CE 1995-2001, all others 1995-2000*
[b] *Birmingham is omitted from this comparison because the relevant Eurostat data is not available.*
[c] *Geographic differential = largest estimate – smallest estimate*

[13] Annual employment growth rates 1995-2000; in some cases the period differs slightly owing to different availability of data

**Table 8. The employment supplier effect[a]**

| City[b] | CE | EBS | BAK | Supplier differential[b] |
|---|---|---|---|---|
| **Lyon** | 3.35 | 1.04 | 1.50 | 2.31 |
| **The Hague** | 3.43 | 1.64 | | 1.80 |
| **Helsinki** | 5.38 | 3.62 | | 1.76 |
| **Madrid** | 3.19 | 3.99 | 2.33 | 1.66 |
| **Marseille** | 2.52 | 1.12 | | 1.40 |
| **London** | 3.54 | 2.78 | 2.18 | 1.36 |
| **Milan** | 2.12 | 0.87 | 0.95 | 1.25 |
| **Strasbourg** | 2.52 | 1.51 | 1.41 | 1.11 |
| **Copenhagen** | 3.27 | 2.19 | | 1.08 |
| **Turin** | 1.46 | 0.99 | 0.39 | 1.07 |
| **Barcelona** | 3.22 | 4.27 | | 1.05 |
| **Dublin** | 6.86 | 5.92 | | 0.94 |
| **Rome** | 1.96 | 1.05 | | 0.91 |
| **Berlin** | -0.71 | -0.70 | 0.14 | 0.85 |
| **Hamburg** | 0.56 | 0.08 | 0.74 | 0.66 |
| **Paris** | 1.40 | 0.95 | 1.57 | 0.62 |
| **Brussels** | 0.22 | 0.82 | | 0.60 |
| **Stockholm** | 2.40 | 1.97 | | 0.43 |
| **Athens** | 2.18 | 1.92 | | 0.26 |
| **Manchester** | 0.97 | 1.19 | | 0.22 |

[a] *Employment growth for cities that are defined identically by suppliers, using the suppliers' own estimates of employment. Growth rates are annual averages as follows: CE 1995-2001, all others 1995-2000*
[b] *Supplier differential = largest estimate – smallest estimate*

### 3.3 Output

The supplier effect for GVA growth, as with employment, is also larger than the geographic effect. More significantly, it is greater than the supplier effect for productivity. Not least, for London where the boundary is universally accepted, supplier estimates of job growth differ by more than half of the highest estimate.

These issues highlight the real source of the problem: because suppliers are not content with the quality of the data they receive from official sources, they carry out transformations which, from their point of view, improve the data. But suppliers apply different transformations, and so the final effect is to add to the variation in estimates available and, paradoxically, lower the confidence that can be placed in it.

In the particular case of GVA, there is no generally accepted standard measure of real output all for cities.

### Table 9. The GVA geographic effect[a]

| City | CE city definition | EBS city definition | BAK city definition | Geographic differential[b] |
|---|---|---|---|---|
| **Munich** | 3.64 | 2.19 | 3.42 | 1.45 |
| **Stuttgart** | 2.98 | 2.84 | 3.67 | 0.84 |
| **Amsterdam** | 4.70 | 4.70 | 4.01 | 0.69 |
| **Frankfurt** | 2.10 | 1.72 | 1.97 | 0.39 |
| **Cologne** | 1.08 | 1.38 | 1.38 | 0.30 |
| **Lisbon** | 4.44 | 4.55 | - | 0.11 |
| **Birmingham** | 1.89 | 1.88 | - | 0.01 |

*[a] GVA growth for cities that are defined differently by suppliers, using standardised (Eurostat) measures of GVA for the supplier's city definition. Growth rates are annual averages as follows: CE 1995-2001, all others 1995-2000*
*[b] Geographic differential = largest estimate – smallest estimate*

### Table 10. The GVA supplier effect[a]

| City | CE | EBS | BAK | Supplier differential[b] |
|---|---|---|---|---|
| **Madrid** | 4.87 | 4.43 | 2.33 | 2.54 |
| **London** | 4.67 | 3.81 | 2.18 | 2.49 |
| **Dublin** | 12.20 | 9.94 | | 2.26 |
| **Helsinki** | 8.43 | 6.40 | | 2.03 |
| **Hamburg** | 2.66 | 2.08 | 0.74 | 1.92 |
| **Lyon** | 3.35 | 3.04 | 1.50 | 1.85 |
| **Turin** | 2.17 | 1.72 | 0.39 | 1.78 |
| **Milan** | 2.63 | 2.26 | 0.95 | 1.68 |
| **Berlin** | -0.75 | -1.09 | 0.14 | 1.23 |
| **Paris** | 2.78 | 2.70 | 1.57 | 1.21 |
| **Strasbourg** | 2.52 | 2.61 | 1.41 | 1.20 |
| **Stockholm** | 6.39 | 5.24 | | 1.15 |
| **Athens** | 3.75 | 2.62 | | 1.12 |
| **Rome** | 2.48 | 1.49 | | 0.99 |
| **The Hague** | 3.98 | 3.43 | | 0.56 |
| **Barcelona** | 3.83 | 3.30 | | 0.53 |
| **Copenhagen** | 2.74 | 3.23 | | 0.49 |
| **Marseille** | 2.52 | 2.36 | | 0.17 |
| **Brussels** | 2.44 | 2.29 | | 0.15 |
| **Manchester** | 2.26 | 2.12 | | 0.15 |

*[a] GVA growth for cities that are defined identically by suppliers, using the suppliers' own estimates of GVA. Growth rates are annual averages as follows: CE 1995-2001, all others 1995-2000*
*[b] Supplier differential = largest estimate – smallest estimate*

# 4. The GLA cities dataset

If it was possible to arrive at an agreed definition of the cities in this dataset, an obvious standard could be set. There is, however, no such agreement. The GLA group has adopted an interim standard definition for each city in its cities dataset. This definition will be used within the GLA group for economic comparisons between London and other cities. This dataset is reproduced in Tables 11, 12 and 13.

It is constructed as follows. A standard definition is adopted for each city, using the statistical-pragmatic approach. NUTS-3 or higher regions are then selected which form a clear consensus among suppliers or, on the basis of information available so far, most closely correspond to the functional urban region of the city. For the NUTS areas included in the definition of each city, official employment[14] and output data are obtained from Eurostat, and aggregated to calculate the city's employment and output. Output is deflated using euro deflators placed in the public domain by Eurostat. Finally, productivity is calculated as the ratio of real output to employee jobs.

No claim is made that this dataset is superior to others available. It is simply the closest that exists to a standard. Moreover, when data on productivity is obtained from other sources, or cited in reports under consideration by the GLA group, it can be compared against the reference set to assess whether this data contains additional, possibly unstated assumptions, and evaluate their impact on any analysis.

In tendering for the supply of information about cities, the GLA will require suppliers who differ from these estimates, as part of what they provide, to explain the reasons for the difference.

The same principle can be extended to other indicators, where these are available from Eurostat.

The effect of specifying real output in euros – that is, in effect, using the euro as a reference currency - should be noted. First of all, for countries within the Eurozone, it means that no attempt is made to distinguish the effect of local price differences. The output of Athens, for example, is compared with the output of Frankfurt by simply measuring this output in euros and deflating it using the Europe-wide deflator supplied by Eurostat. But since the output prices for Athens producers are generally lower than Frankfurt prices, this means that a given basket of output in Athens will sell for less euros than the same basket in Frankfurt. This method therefore underestimates the real output of Athens.

A second problem arises for the UK and more generally, for any country not in the Eurozone, because of the impact of exchange rates. If the pound is falling against the euro (purchases less euros) then when London's output, for example, is converted into euros, it will be

[14] It would be preferable to collate data on workforce employment (employees plus self-employed). Currently, Eurostat data on employees is more widely available than data on self-employed, and therefore only employee jobs are reported.

correspondingly reduced. If by good fortune, the pound's exchange rate was always in equilibrium and equal to the ratio between the price levels in the UK and in the Eurozone, this would not matter. In fact this rarely happens,[15] and so if the pound falls faster than the relative inflation rate, it will make it appear that London's productivity is lower, and vice versa.

A number of directions are being actively investigated to deal with these problems – for example, the use of Purchasing Power Parity measurements of output, particularly those based on producer prices, which the University of Groningen's International Comparisons of Output and Productivity is leading. A second issue, as already mentioned, is the improvement or standardisation of measures of service industry output. GLA Economics will maintain an active interest in research in this area and its results.

Much of the difference between estimates arises precisely because suppliers are trying to address these rather difficult questions, and this is not to be discouraged. Once again, there is no reason to think supplier differences arise because some suppliers are inferior to others. To the contrary, the work of the city data suppliers is, in a certain sense, at the cutting edge of a relatively new research area. The problem confronting the GLA group is that it is a policy-making body whose decisions must be based on consistent standards arising from common assumptions, and it is obliged to seek standardisation.

[15] There is a large body of economic literature which seeks to explain how exchange rates can deviate for long periods from their equilibrium levels based on the seminal 1976 paper by Rudiger Dornbusch, Expectations and exchange rate dynamics, Journal of Political Economy.

**Table 11. Population (thousands)**

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Amsterdam** | 6,640 | 6,700 | 6,757 | 6,805 | 6,839 | 6,862 | 6,885 | 6,916 | 6,957 | 7,002 | 7,049 |
| **Athens** | 3,526 | 3,521 | 3,514 | 3,501 | 3,486 | 3,465 | 3,449 | 3,449 | 3,450 | 3,450 | 3,892 |
| **Barcelona** | 4,627 | 4,653 | 4,651 | 4,647 | 4,641 | 4,634 | 4,632 | 4,631 | 4,634 | 4,644 | 4,667 |
| **Berlin** | 3,420 | 3,440 | 3,456 | 3,471 | 3,474 | 3,471 | 3,467 | 3,445 | 3,414 | 3,393 | 3,384 |
| **Birmingham** | 2,615 | 2,629 | 2,631 | 2,636 | 2,635 | 2,637 | 2,644 | 2,641 | 2,628 | 2,627 | 2,560 |
| **Brussels** | 962 | 956 | 951 | 950 | 950 | 950 | 949 | 952 | 954 | 955 | 962 |
| **Cologne** | 1,526 | 1,538 | 1,549 | 1,557 | 1,562 | 1,567 | 1,571 | 1,573 | 1,574 | 1,575 | 1,577 |
| **Copenhagen** | 601 | 602 | 604 | 604 | 605 | 606 | 608 | 610 | 611 | 612 | 614 |
| **Dublin** | 1,015 | 1,025 | 1,037 | 1,038 | 1,039 | 1,045 | 1,058 | 1,074 | 1,088 | 1,097 | 1,110 |
| **Frankfurt** | 1,489 | 1,506 | 1,525 | 1,535 | 1,531 | 1,528 | 1,529 | 1,530 | 1,530 | 1,533 | 1,541 |
| **Hamburg** | 1,641 | 1,661 | 1,679 | 1,700 | 1,704 | 1,707 | 1,708 | 1,707 | 1,702 | 1,703 | 1,710 |
| **Helsinki** | 1,226 | 1,240 | 1,255 | 1,270 | 1,286 | 1,302 | 1,319 | 1,336 | 1,354 | 1,371 | 1,387 |
| **Lisbon** | 2,476 | 2,474 | 2,529 | 2,532 | 2,537 | 2,541 | 2,545 | 2,550 | 2,556 | 2,564 | 2,574 |
| **London** | - | - | - | 6,928 | 6,961 | 6,999 | 7,052 | 7,110 | 7,187 | 7,285 | 7,104 |
| **Lyon** | 1,512 | 1,524 | 1,536 | 1,544 | 1,549 | 1,554 | 1,559 | 1,564 | 1,572 | 1,582 | 1,591 |
| **Madrid** | 4,878 | 4,956 | 4,975 | 4,992 | 5,002 | 5,009 | 5,019 | 5,032 | 5,050 | 5,087 | 5,151 |
| **Manchester** | 2,591 | 2,571 | 2,574 | 2,580 | 2,583 | 2,583 | 2,581 | 2,578 | 2,577 | 2,577 | 2,487 |
| **Marseille** | 1,763 | 1,773 | 1,783 | 1,791 | 1,798 | 1,806 | 1,812 | 1,820 | 1,829 | 1,840 | 1,852 |
| **Milan** | - | - | 3,741 | 3,734 | 3,726 | 3,723 | 3,724 | 3,733 | 3,745 | 3,755 | 3,766 |
| **Munich** | 1,986 | 2,012 | 2,038 | 2,060 | 2,059 | 2,055 | 2,051 | 2,042 | 2,030 | 2,034 | 2,056 |
| **Paris** | 10,670 | 10,725 | 10,774 | 10,814 | 10,847 | 10,872 | 10,890 | 10,905 | 10,929 | 10,962 | 11,002 |
| **Rome** | 3,745 | 3,759 | 3,766 | 3,773 | 3,774 | 3,774 | 3,778 | 3,792 | 3,806 | 3,814 | 3,833 |
| **Stockholm** | 1,636 | 1,648 | 1,662 | 1,678 | 1,709 | 1,726 | 1,744 | 1,754 | 1,773 | 1,793 | 1,813 |
| **Strasbourg** | 956 | 965 | 974 | 983 | 991 | 999 | 1,006 | 1,013 | 1,021 | 1,030 | 1,039 |
| **Stuttgart** | 907 | 924 | 940 | 945 | 939 | 937 | 938 | 941 | 941 | 943 | 947 |
| **The Hague** | 695 | 699 | 701 | 702 | 703 | 703 | 705 | 707 | 710 | 713 | 719 |
| **Turin** | 2,261 | 2,239 | 2,236 | 2,236 | 2,232 | 2,225 | 2,222 | 2,221 | 2,218 | 2,215 | 2,215 |

## Table 12. Output

| | Current prices, millions of euros | | | | | | At constant prices, millions of 1995 euros | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
| Amsterdam | 155,674 | 158,925 | 164,105 | 174,310 | 185,972 | 199,961 | 155,674 | 160,144 | 167,493 | 175,618 | 183,175 | 189,485 |
| Athens | 34,221 | 35,933 | 38,758 | 39,762 | 43,450 | 45,924 | 34,221 | 33,745 | 34,507 | 35,963 | 37,576 | 39,702 |
| Barcelona | 63,887 | 69,416 | 71,016 | 74,290 | 80,195 | 85,648 | 63,887 | 66,128 | 68,233 | 70,252 | 73,453 | 75,810 |
| Berlin | 80,783 | 78,080 | 74,738 | 74,698 | 75,177 | 75,113 | 80,783 | 78,764 | 77,047 | 76,344 | 75,940 | 76,067 |
| Birmingham | 37,645 | 39,269 | 48,920 | 51,912 | 55,994 | 63,735 | 37,645 | 37,307 | 38,439 | 38,779 | 39,816 | 41,347 |
| Brussels | 40,145 | 40,931 | 41,311 | 43,358 | 45,493 | 47,030 | 40,145 | 41,234 | 42,324 | 43,788 | 44,996 | 45,950 |
| Cologne | 52,990 | 53,352 | 52,908 | 54,739 | 54,578 | 55,204 | 52,990 | 53,819 | 54,542 | 55,945 | 55,132 | 55,905 |
| Copenhagen | 19,875 | 20,848 | 21,638 | 22,254 | 23,666 | 24,999 | 19,875 | 20,430 | 21,100 | 21,529 | 22,289 | 22,919 |
| Dublin | 19,180 | 21,979 | 27,098 | 30,349 | 34,968 | 40,087 | 19,180 | 20,947 | 23,387 | 25,908 | 28,794 | 31,661 |
| Frankfurt | 66,164 | 66,903 | 66,107 | 66,661 | 69,963 | 72,014 | 66,164 | 67,489 | 68,149 | 68,130 | 70,673 | 72,929 |
| Hamburg | 66,236 | 66,324 | 66,444 | 68,301 | 69,946 | 72,044 | 66,236 | 66,905 | 68,497 | 69,806 | 70,656 | 72,958 |
| Helsinki | 33,498 | 35,088 | 37,495 | 41,748 | 44,150 | 48,401 | 33,498 | 35,945 | 37,950 | 41,535 | 43,744 | 46,475 |
| Lisbon | 30,381 | 32,322 | 34,931 | 37,790 | 40,436 | 43,176 | 30,381 | 31,315 | 33,089 | 35,029 | 36,142 | 37,410 |
| London | 148,845 | 159,525 | 204,043 | 227,459 | 245,412 | 279,341 | 148,845 | 151,555 | 160,327 | 169,916 | 174,506 | 181,218 |
| Lyon | 37,459 | 38,939 | 39,942 | 41,837 | 43,701 | 45,594 | 37,459 | 38,195 | 39,394 | 40,809 | 42,130 | 43,533 |
| Madrid | 75,126 | 80,614 | 83,606 | 90,377 | 97,530 | 105,131 | 75,126 | 76,796 | 80,330 | 85,465 | 89,330 | 93,055 |
| Manchester | 34,526 | 36,872 | 46,048 | 48,932 | 52,359 | 59,598 | 34,526 | 35,030 | 36,182 | 36,553 | 37,231 | 38,663 |
| Marseille | 34,702 | 35,490 | 35,659 | 37,347 | 39,036 | 40,922 | 34,702 | 34,812 | 35,169 | 36,429 | 37,633 | 39,072 |
| Milan | 84,901 | 98,323 | 104,532 | 109,985 | 115,711 | 121,009 | 84,901 | 85,884 | 87,828 | 90,639 | 93,528 | 95,818 |
| Munich | 81,525 | 82,656 | 82,437 | 86,588 | 91,173 | 95,255 | 81,525 | 83,381 | 84,984 | 88,495 | 92,098 | 96,465 |
| Paris | 335,628 | 347,533 | 352,081 | 364,266 | 383,740 | 402,824 | 335,628 | 340,892 | 347,245 | 355,322 | 369,944 | 384,613 |
| Rome | 67,635 | 77,749 | 82,057 | 86,842 | 89,288 | 93,856 | 67,635 | 67,912 | 68,944 | 71,567 | 72,171 | 74,318 |
| Stockholm | 45,301 | 52,322 | 55,640 | 57,997 | 65,619 | 73,659 | 45,301 | 47,160 | 50,176 | 53,498 | 59,379 | 63,079 |
| Strasbourg | 21,769 | 22,466 | 22,384 | 23,469 | 24,584 | 25,586 | 21,769 | 22,036 | 22,076 | 22,893 | 23,700 | 24,429 |
| Stuttgart | 37,823 | 37,904 | 39,627 | 40,442 | 42,574 | 44,733 | 37,823 | 38,236 | 40,851 | 41,333 | 43,006 | 45,301 |
| The Hague | 17,046 | 17,402 | 17,951 | 18,975 | 20,247 | 21,904 | 17,046 | 17,535 | 18,321 | 19,117 | 19,942 | 20,757 |
| Turin | 39,741 | 45,651 | 49,030 | 50,215 | 52,749 | 55,150 | 39,741 | 39,876 | 41,195 | 41,383 | 42,636 | 43,670 |

**Table 13. Employment and productivity**

| | Employees (thousands) | | | | | | Productivity (thousands of constant 1995 euros per employee) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
| Amsterdam | 2,355 | 2,417 | 2,508 | 2,601 | 2,681 | 2,732 | 66.1 | 66.2 | 66.8 | 67.5 | 68.3 | 69.4 |
| Athens | 919 | 908 | 913 | 958 | 1,081 | 1,083 | 37.2 | 37.2 | 37.8 | 37.5 | 34.8 | 36.6 |
| Barcelona | 1,531 | 1,578 | 1,613 | 1,669 | 1,751 | 1,813 | 41.7 | 41.9 | 42.3 | 42.1 | 42.0 | 41.8 |
| Berlin | 1,457 | 1,421 | 1,387 | 1,376 | 1,376 | 1,394 | 55.5 | 55.4 | 55.6 | 55.5 | 55.2 | 54.6 |
| Birmingham | 1,125 | 1,127 | 1,139 | 1,148 | 1,158 | - | 33.5 | 33.1 | 33.8 | 33.8 | 34.4 | |
| Brussels | - | - | - | 559 | 570 | 582 | | | | 78.4 | 78.9 | 78.9 |
| Cologne | 728 | 731 | 735 | 744 | 773 | 806 | 72.8 | 73.6 | 74.2 | 75.2 | 71.4 | 69.4 |
| Copenhagen | 311 | 322 | 329 | 341 | 346 | 348 | 63.8 | 63.4 | 64.2 | 63.2 | 64.4 | 65.8 |
| Dublin | 394 | 410 | 434 | 479 | 510 | 532 | 48.7 | 51.1 | 53.9 | 54.1 | 56.5 | 59.6 |
| Frankfurt | 852 | 858 | 856 | 865 | 880 | 912 | 77.7 | 78.6 | 79.6 | 78.8 | 80.3 | 80.0 |
| Hamburg | 1,854 | 1,842 | 1,825 | 1,833 | 1,846 | 1,885 | 35.7 | 36.3 | 37.5 | 38.1 | 38.3 | 38.7 |
| Helsinki | 588 | 604 | 626 | 651 | 678 | 697 | 57.0 | 59.5 | 60.6 | 63.8 | 64.5 | 66.7 |
| Lisbon | 1,013 | 1,028 | 1,030 | 1,056 | 1,081 | - | 30.0 | 30.5 | 32.1 | 33.2 | 33.4 | |
| London | 3,451 | 3,502 | 3,620 | 3,773 | 3,960 | - | 43.1 | 43.3 | 44.3 | 45.0 | 44.1 | |
| Lyon | 625 | 627 | 636 | 652 | 671 | 692 | 59.9 | 60.9 | 61.9 | 62.6 | 62.8 | 62.9 |
| Madrid | 1,772 | 1,771 | 1,815 | 1,896 | 2,011 | 2,070 | 42.4 | 43.4 | 44.3 | 45.1 | 44.4 | 45.0 |
| Manchester | 1,030 | 1,055 | 1,059 | 1,071 | 1,124 | - | 33.5 | 33.2 | 34.2 | 34.1 | 33.1 | |
| Marseille | 580 | 580 | 588 | 599 | 618 | 643 | 59.9 | 60.1 | 59.8 | 60.9 | 60.9 | 60.8 |
| Milan | 1,491 | 1,498 | 1,509 | 1,549 | 1,576 | 1,582 | 57.0 | 57.3 | 58.2 | 58.5 | 59.3 | 60.6 |
| Munich | 1,092 | 1,086 | 1,086 | 1,104 | 1,131 | 1,167 | 74.7 | 76.8 | 78.3 | 80.2 | 81.5 | 82.7 |
| Paris | 4,650 | 4,650 | 4,680 | 4,772 | 4,918 | 5,055 | 72.2 | 73.3 | 74.2 | 74.5 | 75.2 | 76.1 |
| Rome | 1,295 | 1,283 | 1,293 | 1,302 | 1,332 | 1,365 | 52.2 | 52.9 | 53.3 | 55.0 | 54.2 | 54.4 |
| Stockholm | 905 | 922 | 912 | 941 | 969 | 968 | 50.0 | 51.1 | 55.0 | 56.8 | 61.3 | 65.1 |
| Strasbourg | 371 | 373 | 381 | 390 | 400 | 414 | 58.7 | 59.1 | 58.0 | 58.7 | 59.3 | 59.1 |
| Stuttgart | 568 | 570 | 574 | 577 | 573 | 602 | 66.6 | 67.1 | 71.2 | 71.7 | 75.1 | 75.2 |
| The Hague | 267 | 270 | 279 | 289 | 295 | 301 | 63.9 | 65.0 | 65.6 | 66.1 | 67.7 | 68.9 |
| Turin | 727 | 743 | 750 | 755 | 774 | 785 | 54.6 | 53.7 | 54.9 | 54.8 | 55.1 | 55.6 |

# 5. Guidelines for the GLA group when commissioning city data

The GLA recognises that there is presently no single, authoritative standard for the provision of economic and social indicators for cities. At the same time, a great deal of informative and innovative work is carried out by both official agencies and private consultants to define, collate and analyse quantitative information about cities.

The GLA group places a high premium on consistency and standardisation. GLA organisations must ensure that the data they collect and use in drawing up their policies is the best available. They should also ensure that policies draw up in different fields are consistent with one another. Also, as far as possible, policies should be consistent with policies adopted by other agencies with whom they share responsibility, or with whose policies they interact.

Following this, it is important that GLA organisations use the same body of data to refer to the same indicators wherever practically possible. Indicators must also, as far as possible, be consistent and comparable with indicators used by other policy-making bodies with which they interact particularly other governmental bodies.

Subject to these two overriding constraints, the GLA group seeks to promote the best possible standard of data collection and measurement. Finally, it seeks to ensure that the assumptions it made in order to arrive at its policies are clear and explicit.

A particular problem exists for the measurement of many cities, which does not apply with such force for national entities. In the US, Canada, and some other countries there is an agreed and regulated national definition of where each city's boundaries lie, but there is no such standard in Britain, the rest of Europe, and many other countries.

Eurostat's work has led to a process of harmonisation in the provision of regional statistics so that a single set of indicators, compiled on a consistent basis, is available at NUTS-3 level for the whole of Europe. It includes real and nominal output, employment, population and a variety of other indicators.

The GLA will provide suppliers with a reference dataset compiled as follows:

1. It will adopt a working definition of the major European cities. Since its principal aim is to understand the real economic processes governing the development of these cities, its definition will prioritise analytical or functional boundaries over normative or institutional boundaries. Where there is a broad consensus among suppliers, the working definition will reflect this consensus. Where there are differences among suppliers, the GLA will consult with its partners and stakeholders and adopt a definition based on the NUTS3 or higher regions which most closely correspond to the functional urban region of the city.

2. The GLA will calculate indicators for the city by collating the Eurostat (REGIO) statistics for the NUTS-3 regions concerned.

Suppliers will not be asked to reproduce this data, but to supply data which is the most accurate in their judgement. If their estimates differ from the GLA's reference set, they will be asked to explain the reasons for the divergence in a way that if their data is used, the GLA can make clear to the public the assumptions used in compiling the data.

Where GLA organisations are collecting indicators for which there is no Eurostat data, suppliers will be asked to provide a measure of the indicator for the city definition used in the GLA dataset, and for any different definitions they may choose to adopt.

# Appendix A. The US system

In future it will be necessary to devise consistent ways of comparing data on European cities with non-European cities, particularly in the US and Canada. At this stage there has been no time to assess the consequences arising from differences in city definition between Europe and the US except to note that they are substantial. However, the US and particularly the Canadian system are generally considered among the best in the world. It will be important to understand these systems and their relationship to the emerging European system.

In the time available for this study, it was not possible to study US data in detail which is why the shortlist of cities were all European cities. However, for reference purposes it is useful to include the basic definitions supplied by the Office Management and Budget which is responsible for the US regional classification system.

The statistical system of the US is a unified regional classification with automatic provision for adjustment according to explicitly defined criteria. Within it, it contains criteria for the definition of statistical regions to be treated as cities. It is cited here because, if this study is extended outside Europe as is intended by the London Development Agency, it will encounter US cities defined according to the standard specified here and will, accordingly, need to consider how measures of European (and other non-US) cities can be made comparable with US definitions, or make appropriate adjustments for the differences in definition.

### Statistical definitions of the US Office of Management and Budget

| | |
|---|---|
| **Census designated place** | A statistical geographic entity that is equivalent to an incorporated place, defined for the decennial census, consisting of a locally recognized, unincorporated concentration of population that is identified by name. |
| **Central city** | The largest city of a metropolitan statistical area or a consolidated metropolitan statistical area, plus additional cities that meet specified statistical criteria in the 1990 metropolitan area standards. |
| **Central county** | The county or counties of a core based statistical area containing a substantial portion of an urbanized area or urban cluster or both, and to and from which commuting is measured to determine qualification of outlying counties. |
| **Combined area** | A geographic entity consisting of two or more adjacent core based statistical areas (CBSAs) with employment interchange rates of at least 15. CBSAs with employment interchange rates of at least 25 combine automatically. CBSAs with employment interchange rates of at least 15 but less than 25 may combine if local opinion in both areas favors combination. |

| | |
|---|---|
| **Core** | A densely settled concentration of population, comprising either an urbanized area (of 50,000 or more population) or an urban cluster (of 10,000 to 49,999 population) defined by the Census Bureau, around which a core based statistical area is defined. |
| **Core based statistical area (CBSA)** | A statistical geographic entity consisting of the county or counties associated with at least one core (urbanized area or urban cluster) of at least 10,000 population, plus adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties with the counties containing the core. Metropolitan and micropolitan areas are two categories of core based statistical areas. |
| **Employment interchange rate** | A measure of ties between two adjacent core based statistical areas (CBSAs) used when determining whether they qualify to be combined. The employment interchange rate is the sum of the percentage of employed residents of the smaller CBSA who work in the larger CBSA and the percentage of employment in the smaller CBSA that is accounted for by workers who reside in the larger CBSA. |
| **Geographic building block** | The geographic unit, such as a county, that forms the basic geographic component of a statistical area. |
| **Main city or town** | A city or town that acts as an employment center within a New England city and town area that has a core with a population of at least 2.5 million. A main city or town serves as the basis for defining a New England city and town area division. |
| **Main county** | A county that acts as an employment center within a core based statistical area that has a core with a population of at least 2.5 million. A main county serves as the basis for defining a metropolitan division. |
| **Metropolitan area** | A collective term, established by OMB and used for the first time in 1990, to refer to metropolitan statistical areas, consolidated metropolitan statistical areas, and primary metropolitan statistical areas. Also, as introduced for this Notice, a core based statistical area associated with at least one urban area that has a population of 50,000 or more; the metropolitan area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting. |

| | |
|---|---|
| **Metropolitan division** | A county or group of counties within a core based statistical area that contains a core with a population of at least 2.5 million. A metropolitan division consists of one or more main counties that represent an employment center or centers, plus adjacent counties associated with the main county or counties through commuting ties. |
| **Metropolitan statistical area** | A geographic entity, defined by OMB for statistical purposes, containing a large population nucleus and adjacent communities having a high degree of social and economic integration with that nucleus. Under the 1990 metropolitan area standards, qualification of an MSA required a city with 50,000 population or more, or an urbanized area of 50,000 population or more and a total population of at least 100,000 (75,000 in New England). MSAs are composed of entire counties, except in New England where the components are cities and towns. |
| **Micropolitan area** | A core based statistical area associated with at least one urban area that has a population of at least 10,000 but less than 50,000. The micropolitan area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting. |
| **Minor civil division** | A type of governmental unit that is the primary legal subdivision of a county, created to govern or administer an area rather than a specific population. |
| **New England county metropolitan area (NECMA)** | Under the 1990 metropolitan area standards, a county based statistical area defined by OMB to provide an alternative to the city and town based metropolitan statistical areas and consolidated metropolitan statistical areas in New England. |
| **New England city and town area (NECTA)** | A statistical geographic entity that is defined using cities and towns as building blocks and that is conceptually similar to the core based statistical areas in New England (which are defined using counties as building blocks). |
| **New England city and town area (NECTA) division** | A city or town or group of cities and towns within a NECTA that contains a core with a population of at least 2.5 million. A NECTA division consists of a main city or town that represents an employment center, plus adjacent cities and towns associated with the main city or town, or with other cities and towns that are in turn associated with the main city or town, through commuting ties. |
| **Outlying county** | A county that qualifies for inclusion in a core based statistical area on the basis of commuting ties with the core based statistical area's central county or counties. |

| | |
|---|---|
| **Outside core based statistical areas** | Counties that do not qualify for inclusion in a core based statistical area. |
| **Principal city** | The largest city of a core based statistical area, plus additional cities that meet specified statistical criteria. |
| **Urban area** | The generic term used by the Census Bureau to refer collectively to urbanized areas and urban clusters. |
| **Urban cluster** | A statistical geographic entity to be defined by the Census Bureau for Census 2000, consisting of a central place(s) and adjacent densely settled territory that together contain at least 2,500 but less than 50,000 people, generally with an overall population density of at least 1,000 people per square mile. For purposes of defining core based statistical areas, only those urban clusters of 10,000 more population are considered. (Previous Notices referred to urban clusters as 'settlement clusters.') |
| **Urbanized area** | A statistical geographic entity defined by the Census Bureau, consisting of a central place(s) and adjacent densely settled territory that together contain at least 50,000 people, generally with an overall population density of at least 1,000 people per square mile. |

# Appendix B. NUTS area definitions adopted by principal suppliers

| GLA Name | CE description | BAK description | EBS description | CE NUTS regions | BAK NUTS regions | EBS NUTS regions |
|---|---|---|---|---|---|---|
| **Amsterdam** | Groot Amsterdam NUTS-3 region | Randstat consisting of NUTS-3 regions: Utrecht + Noord-Holland + Zuid-Holland | Amsterdam | nl326 | nl31 + nl32 + nl33 | nl326 |
| **Athens** | Attiki NUTS-1 region | | Athens | gr3 | | gr3 |
| **Barcelona** | | NUTS-3 | Barcelona | es511 | | es511 |
| **Berlin** | | Bundesland = NUTS-1 | Berlin | de3 | | de3 |
| **Birmingham** | West Midlands County NUTS-2 region | - | Birmingham | ukg3 | | ukg31 |
| **Brussels** | Bruxelles NUTS-1 region | Région Bruxelles-capitale/Brussels hoofdstad gewest = NUTS-1 | Brussels | be1 | | be1 |
| **Cologne** | NUTS-3 regions: Köln, Leverkusen and Erftkreis | Stadtkreis Köln = NUTS-3 | Koln | dea23 + dea24 + dea27 | | dea2 |
| **Copenhagen** | København NUTS-3 region | - | Koebenhavns | dk002 | | dk002 |
| **Dublin** | Dublin NUTS-3 region | - | Dublin | ie021 | | ie021 |
| **Frankfurt** | NUTS-3 regions: Frankfurt, Offenbach, Offenbach Landkreis, Gross -Gerau, Hochtaunuskreis and Main-Taunus-Kreis | Frankfurt AM / Offenbach consisting of NUTS-3 regions: LK Hochtaunuskreis + LK Main-Taunus-Kreis + SK Frankfurt a. Main + LK Offenbach + SK Offenbach | Frankfurt | de712, de713, de71c, de717, de718, de71a | de718 + de71a + de712 + de71c + de713 | de712 |
| **Hamburg** | Hamburg NUTS-1 region | Bundesland = NUTS-1 | Hamburg | de6 | | de6 |
| **Helsinki** | Special definition involving local knowledge (Helsinki is not captured by NUTS-4 region) | - | Helsinki | See description | | fi16 |
| **Lisbon** | NUTS-3 regions: Grande Lisboa and Península de Setúbal | - | Lisboa | pt132 and pt133 | | pt13 |
| **London** | London NUTS-1 region | Greater London = NUTS-1 | Greater London | uki | | uki |

| GLA Name | CE description | BAK description | EBS description | CE NUTS regions | BAK NUTS regions | EBS NUTS regions |
|---|---|---|---|---|---|---|
| **Lyon** | Département du Rhône NUTS-3 region | Rhône = NUTS-3 | Lyon | fr716 | | fr716 |
| **Madrid** | Madrid NUTS-1 region | Comunidad de Madrid = NUTS-3 | Madrid | es3 | es3 | es3 |
| **Manchester** | Greater Manchester NUTS-2 region | - | Greater Manchester | ukd3 | | ukd3 |
| **Marseille** | Département des Bouches du Rhône NUTS-3 region | - | Marseille | fr824 | | fr824 |
| **Milan** | Milano NUTS-3 region | Provincia = NUTS-3 | Milan | it205 | it205 | it205 |
| **Munich** | NUTS-3 regions: München Kreisfreie Stadt, Dachau and München Landkreis | NUTS-3 regions: SK München + LK München + LK Starnberg + LK Dachau + LK Fürstenfeldbruck + LK Ebersberg | Munchen, Kreisefreie Stadt | de212, de217,de21h | de212 + de21h + de21l + de217 + de21c + de218 | de212 |
| **Paris** | Ile de France NUTS-1 region | Ile de France = NUTS-2 | Ile De France | fr1 | fr1 | fr1 |
| **Roma** | Roma NUTS-3 region | - | Rome | it603 | | it603 |
| **Stockholm** | Stockholm NUTS-2 region | - | Stockholm | se01 | | se01 |
| **Strasbourg** | Département de la Gironde NUTS-3 region | Bas-Rhin = NUTS-3 | Strasbourg | fr421 | fr421 | fr421 |
| **Stuttgart** | NUTS-3 regions: Stuttgart, Stadtkreis Böblingen, Esslingen, Ludwigsburg and Rems-Murr-Kreis | consisting of NUTS-3 regions:<br>SK Stuttgart +<br>LK Böblingen | Stuttgart | de111,de112,de113,de115,de116 | de111 + de112 | de11 |
| **The Hague** | Haag Agglomeratie's-Gravenhage NUTS-3 Region | - | The Hague | nl332 | | nl332 |
| **Turin** | Torino NUTS-3 region | NUTS-3 | Torino | it111 | it111 | it111 |

# Appendix C. Acronyms

| | |
|---|---|
| **BAK** | BAK Basel |
| **CE** | Cambridge Econometrics |
| **EBS** | Experian Business Strategies |
| **GAME** | Grans Aglomeracions Metropolitanes Europees |
| **GaWC** | Globalisation and World Cities research project |
| **GEMACA** | Group for European Metropolitan Areas Comparative Analysis |
| **GLA** | Greater London Authority |
| **GVA** | Gross value added |
| **LDA** | London Development Agency |
| **LSE** | London School of Economics |
| **NUTS** | Nomenclature of Statistical Territorial Units |

# Appendix D. Bibliography

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http://www.lboro.ac.uk/gawc/
The home page of the Globalisation and World Cities Study group (GAWC), a research project managed by the Geography Department at Loughborough University, contains much useful information and many valuable links.

http://www.lboro.ac.uk/gawc/citylist.html
Contains links to the official home pages run by most major world cities.