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Abstract

Measuring and Comparing World Cities studies the economic performance of a shortlist of 27 cities, as estimated by seven sources.

The article reproduces, in citable form and, for scholarly purposes, the report of the same name produced by the author for the Greater London Authority, which is available on www.london.gov.uk/mayor/economic_unit/docs/workingpaper_09.pdf

The report finds that estimates of even the most basic indicators, such as the level and growth of city productivity, diverge so much between the providers of estimates, that no single estimate of any indicator of city performance can be relied on. It explains why.

The findings of this paper led GLA Economics to the conclusion that a world standard for comparing cities was required, leading to its work in defining a Functional Urban Region (FUR) for London, and to joint work with the Greater European Metropolitan Areas Comparative Analysis (GEMACA) project, with Eurostat's Urban Audit, and with the territorial working group of the Organisation for Economic Cooperation and Development (OECD), to attempt to define a world standard

The lack of such a world standard led GLA Economics to produce the benchmark dataset reproduced in this paper. This specifies output, employment and productivity for 27 cities, derived from standardised geographical definitions and harmonised data. The dataset serves as a reference for the GLA group and is 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 specified a framework for the GLA group to use when commissioning further data on cities.

Keywords: City; global city; Functional Urban Region; Larger Urban Zone; Territorial Indicators; Metropolitan Region; pluralism

Measuring and Comparing World Cities

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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

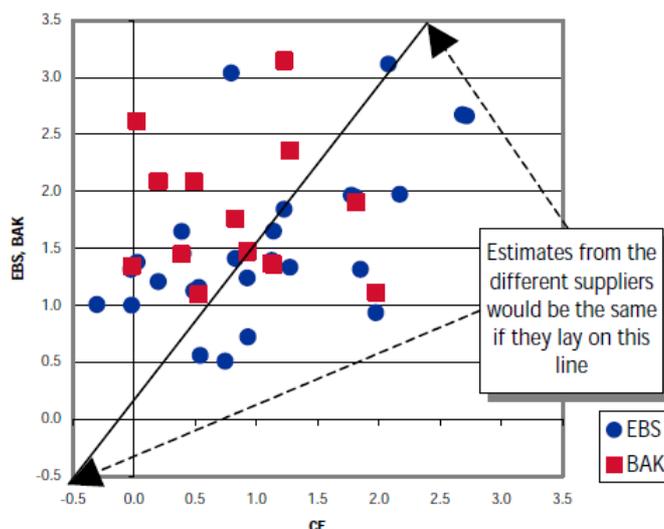
Source: See footnote 2

Note: CE (horizontal axis) 1990-2001 average

EBS (vertical axis) 1991-2001 average

BAK (vertical axis) 1991-2001 average

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



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 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.

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 Metropolitanas Europees – estimates of Greater Metropolitan Areas supplied by Professor Cheshire and produced by the Institut d'Estudis Metropolitanans 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.

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

GLA Name	Growth rates (%)			Largest estimate – smallest estimate	Rankings		
	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	

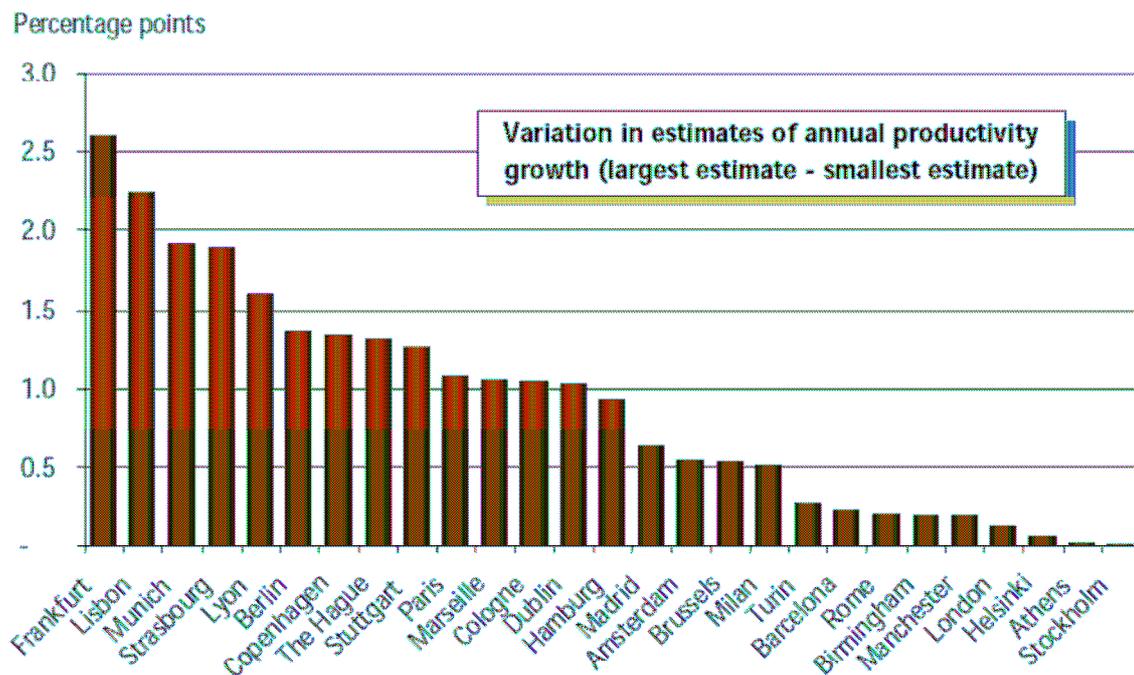
Statistical analysis suggests that the differences between suppliers are highly significant. The average difference between suppliers is six times greater than the average difference between cities; the probability that this could have arisen by chance alone is 0.5 per cent.⁴

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.

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.

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 sources⁵



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 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

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

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 EBS⁶, 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.

Table 3. City area estimates in square kilometres

GLA Name	Statistical definitions ^a				Functional definitions ^a		Max/Min (all definitions)
	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

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.

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.

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.

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 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

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.

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

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.

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

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 city¹⁰
- the sub-city districts, which are the areas that make up the city (wards in the UK).

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.

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.

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/GEMAC A	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 skewed 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.

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.

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.

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.

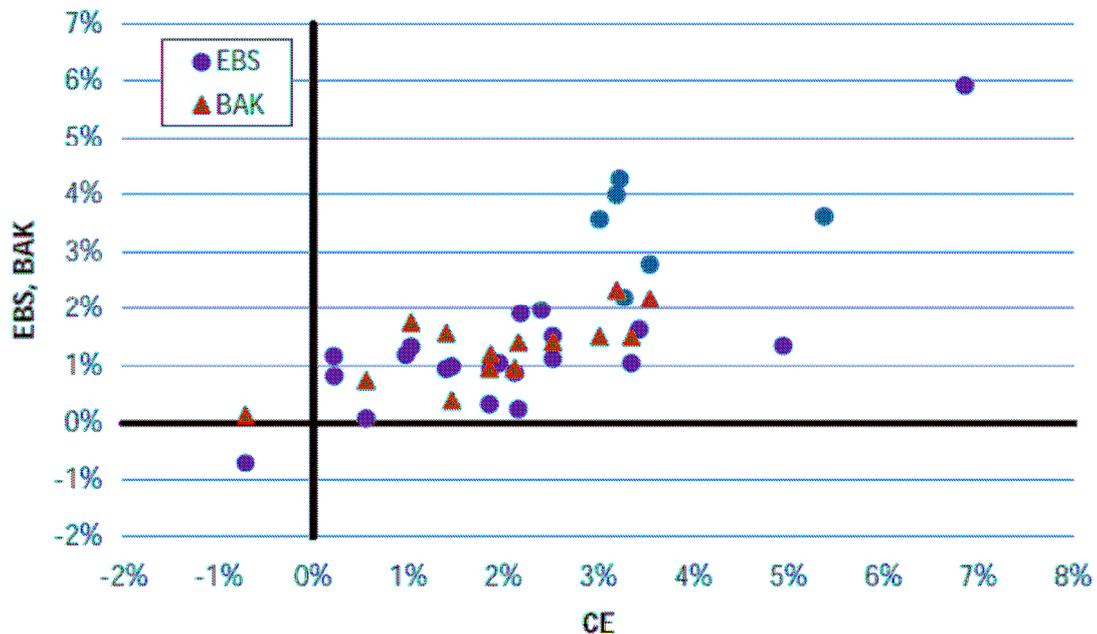
However, the lack of agreement between employment figures is disappointing. To separate the geographic from the supplier component, the same procedure is followed as before.

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

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.
- 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 BAK¹³



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.

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

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

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

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 employment¹⁴ 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 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.

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.

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*.

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.

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 drawn 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.
1. 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 Fürstfeldbruck + LK Ebersberg	München, Kreisfreie Stadt	de212, de217,de21h	de212 + de21h + de211 + 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: SK Stuttgart + 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 Metropolitanas 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

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- GAWC <http://www.lboro.ac.uk/gawc/> is 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.