A Quarter of a Century Progress Report on the Services Sector Productivity Statistics. A Europe-United States Perspective

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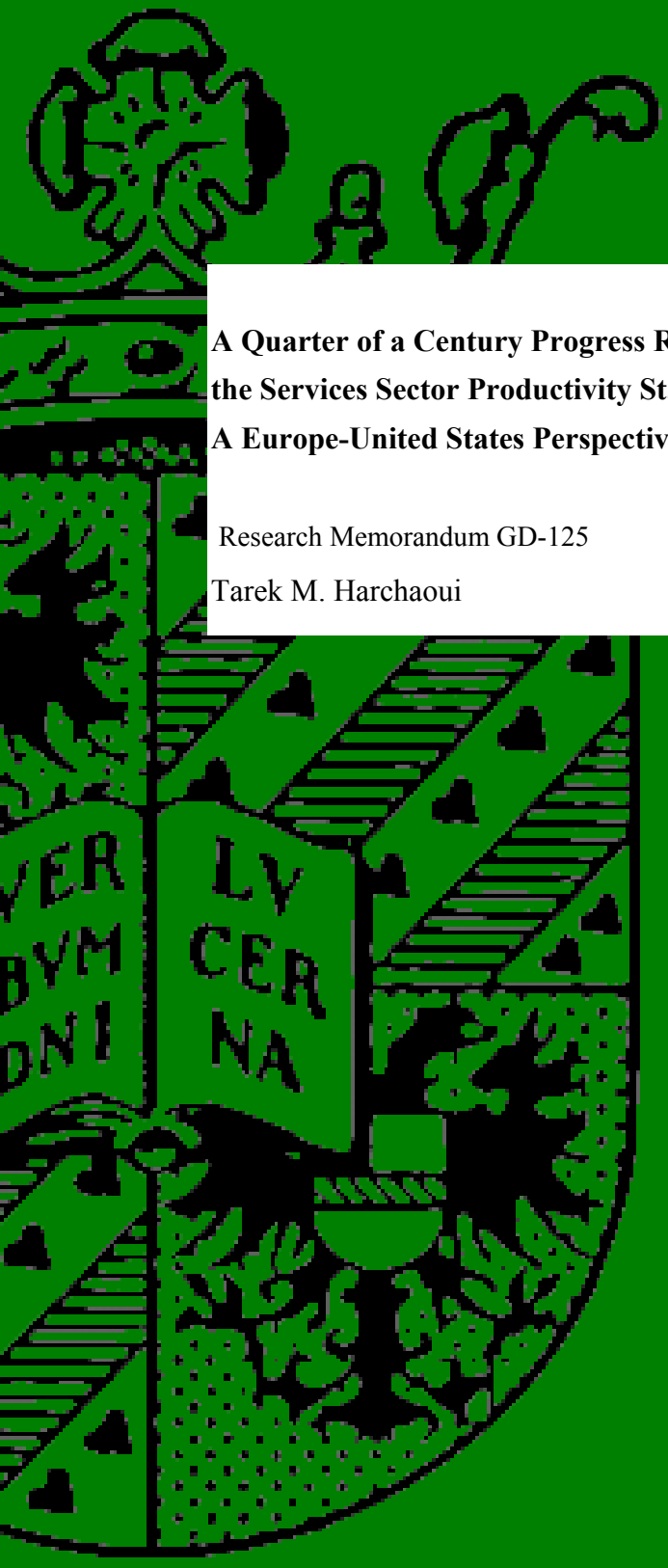

A Quarter of a Century Progress Report on the Services Sector Productivity Statistics A Europe-United States Perspective

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RESEARCH MEMORANDUM

A Quarter of a Century Progress Report on the Services Sector Productivity Statistics*

A Europe-United States Perspective

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Abstract: The deterioration in 1995 of Europe productivity performance relative to the U.S. coincided with the 'renaissance' of the U.S. statistical system, which has been upgraded in many important respects. With these efforts, there is now a consensus in the economics profession that the U.S. statistical system has set a new frontier in official statistics. This paper raises the natural question whether the European statistical system was 'left at the station' while its U.S. counterpart 'departed,' making it possible for measurement differences to become the primary suspect of the existing productivity gap. Our retrospective examination at the development of the services sector productivity statistics in both Europe and the U.S. suggests the presence of a circumstantial evidence in support of measurement differences. The evidence based on a 'structured guess' suggests that the upgrade in the U.S. services sector statistics translated into enhancements of two kinds in the post-1995 period—a considerable reduction in the contribution of industries that traditionally dampened the aggregate productivity trend combined with a higher contribution of those that generally lifted it. This contrasts markedly with Europe where the contribution of these two sources remained unchanged in the meantime, reflecting important gaps in terms of scope of the service producer price index program and the timing of its implementation.

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'Thus, while I conclude that the glass is still half empty, this should not be taken as reason to despair. Rather, it is a challenge for the next generation of researchers to make progress. There is still a long way to go, but the previous generation has provided them with good shoulders on which to stand.'

Zvi Griliches,
A Perspective on What We Know About
the Sources of Productivity Growth (2001)

1. Introduction

With Europe experiencing a sluggish economic growth, policy makers face the urgent task of reigniting faster GDP growth to restore the long-term growth path in a rapidly changing global economy.[1] Economic growth is clouded by problems in data and uncertainty about measures of the services sector economy, where nearly four of five developed nations' workers earn their livelihoods. Concerns about the gaining importance of this sector stems largely from a suspicion that, as economies become more service-oriented, they also become less buoyant. Some of these concerns translated into the realm of productivity measurement when advanced nations' productivity entered since 1973 a long phase of sluggish growth.

For more than two decades, economists have peered into the adequacy of the measurement framework and generally came to terms with a number of daunting problems, ranging from the difficulty of defining and measuring many service outputs and adjusting such measurements for quality improvements and inflation. Many of the developments in the economic literature made their way into the United States (U.S.) statistical system, which also benefited from a substantial increase in funding since the late 1990s. For example, the Bureau of Labor Statistics (BLS) has developed many new producer price indexes in services, while the Census Bureau has expanded the coverage, detail, and frequency of data collected for services. As a result, the Bureau of Economic Analysis (BEA) annual industry accounts, based on the improved Census data, now provide a more reliable source for intermediate inputs, as well as outputs, for services and other nonmanufacturing industries.

The significant role of the services sector in the industry allocation of the post-1995 productivity resurgence led Bosworth and Triplett (2007, 15) to conclude that:

[1] In this paper, the word 'Europe' is used in a generic sense. It refers to the 15 countries constituting the European Union before 2004—Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Spain, Portugal, Sweden, United Kingdom.

'*The situation on services data is far better today than it was when Martin Baily and Robert Gordon (1988) reviewed the consistency of industry data for productivity analysis or when Zvi Griliches (1992, 1994) reviewed the state of the data on output and productivity measurement in the services industries. A tremendous amount has been accomplished*.'

While this feeling seems to be equally shared by the U.S. policy community,[2] the progress shown by the U.S. statistical system went beyond the use of more reliable source data and the adoption of enhanced measurement methods to include additional efforts deployed in recent years towards integration and consistency.

During the same period, Europe has also experienced a significant development of its statistical system, triggered by the need to support and monitor the policy initiatives led by the newly created institutions, such as the Council, the European Commission and the European Central Bank (see Eurostat 2008). Europe has made sustained efforts that started with a harmonization in the sources, concepts and methods, continued with major data gaps initiatives meant to enhance the coverage of the services sector in terms of key nominal variables and price indexes and, recently, culminated with the development of a production account suitable for growth accounting (see O'Mahony and Timmer 2009).

A key finding related to this development is the appearance since 1995 of a significant productivity growth gap between Europe and the U.S. ascribed primarily to the market services sector. Whether this gap is driven by differences in measurement, economics structures or 'pure' economic performance still remains an open question despite an abundant documentation of the underlying facts at the industry level (see Timmer et al. 2010).

This paper, motivated by the presence of this gap, focuses narrowly but more deeply on measurement differences between Europe and the U.S. In our attempt to assess whether the European services sector is really 'sick' or is it just that the 'measuring thermometer' is inaccurate, we deliberately stay away from any review of

[2] In a speech delivered to the National Association of Business Economists, Alan Greenspan (2001) declared: '*I am encouraged by the progress that economists and economic statisticians have been making to date in tackling the daunting task of measuring real output and prices in a rapidly changing economy*.' Greenspan Calls for Better Data Collection, The New York Times, p. C2, Wednesday March 28, 2001, http://www.nytimes.com/2001/03/28/business/greenspan-calls-for-better-data-collection.html . See also Cooper (2005) for a similar point of view.

the literature and put the emphasis on developments that translated into enhancements to source data, concepts and methods of the statistical systems. Along the way, we ask the following three related questions: Was the European statistical system 'left at the station' when its U.S. counterpart departed in the second half of the 1990s? In other words, are the enhancements made to the European statistical system—both in terms of scope and timing—commensurate with those of its U.S. counterpart—considered by now as the new benchmark in official statistics? Second, what is the nature of these efforts, what was their impact on the measurement framework and are there any outstanding gaps between Europe and the U.S. that potentially drive the existing productivity gap? Third, how do these efforts translate into the services sector productivity trend? In other words, can we quantify the benefits of these efforts in terms of upgrades in the aggregate productivity trends?

With this scope in mind, we extend the earlier work published on both sides of the Atlantic which generally took issue at one aspect of measurement at a time without generally considering a Europe-U.S. perspective as we do. For example, as the services sector continued to expand its relative importance in the economy, Abraham (2005) and Triplett and Bosworth (2004) highlighted the role of data development that contributed to address U.S. longstanding measurement problems that have stymied research in the past. In this paper, not only do we outline the data development in both Europe and the U.S., we also pay a particular attention on how this may have impacted the reliability of the estimates.

Timmer et al. (2010) focused on European methods underlying the output constant price series and stressed the need for additional efforts in areas such as distributive trade, transport, communication and banking. A similar conclusion was reached by Crespi et al. (2006) for the UK. We too look at the deflation methods, albeit through a variety of angles. First, we update Timmer's et al. (2010) work by contrasting the state of the deflation methods between the pre- and post-2006 periods for major industry groupings of the European services sector. With this time series, we are in a position to assess how much progress has been made and to draw some general implications on the reliability of the productivity estimates. Second, we also examine the situation of the services producer price index (SPPI) in Europe—and in the U.S.—and report back on its scope and state of implementation. Third, given that the SPPI constitutes a critical input to the deflation methods, we ascertain the extent to which this program fed into the efforts to enhance the deflation methods that the European

statistical system initiated during the 2000s. Finally, we thought that the experience of some European member states is worth highlighting as they constitute a raw model for the rest of the Union.

While adequate data—both in current and constant prices—constitute certainly the minimal requirements to arrive at a reliable set of productivity statistics, they are by no means sufficient. The U.S. industry productivity data represent a good counter-example in this respect. While both the BEA and BLS data both reflected the latest development in the source data, they provided a completely different story in terms of the industry allocation of the productivity revival, thereby leaving productivity users in a state of despair.[3] Hence, an integrated data set also constitutes a necessary requirement for reliability. In this perspective, our approach, while different in scope, is closer to Oulton (2004) who, as part of the Allsopp Review of Statistics for Economic Policy Making in the UK (see Allsopp 2004), outlined the productivity data gaps with an emphasis on the need to adopt a consistent framework.

In offering a progress report on the situation of the services sector productivity statistics in Europe, we considered important to have in mind a yardstick, represented by the U.S. statistical system. Therefore, in a broad-brush background information, we highlighted the long path of the U.S. statistical system towards its current enviable situation, identified the forces at work along with the various enhancements experienced over time. We then contrasted these developments with those initiated in Europe during the so-called 'love affair' period between statistics and policy, when the major institutions of the Union were erected. We quantify the impacts of these developments and those of some crying gaps on the reliability of the aggregate productivity trends.

2. Productivity growth in the Services Sector: Post-Mortem or Second Wind?

We begin with a brief retrospective examination at the development of the services sector and its impact on the U.S. productivity growth, asking what economists knew—or thought they knew—about this services sector during various episodes over the quarter of a century period following the mid-1960s when economists came to the realization that services have altered the structure of the economy. We examine the historical

[3] Information technology-using industries were the horse-power on the basis of BEA data, compared to information technology-producing industries for their BLS counterpart. Following the lead of Jorgenson and Landefeld (2005), the U.S. statistical system has made in recent years important strides in the area of consistency and integration. More on this below.

record not to establish yet another literature review, but to obtain a better understanding of how the evolving productivity picture was perceived in 'real time.' In particular, we ask why it took more than two decades for economists to place services sector's measurement issues at the center of the productivity slowdown, why the U.S. statistical system was so slow to adapt to the changing structure of the economy before embarking in major upgrades in the second half of the 1990s and how did its European counterpart fare in the meantime.

2.1. The Diagnosis of a New 'Disease'

The increasing importance gained by the services sector in the decades following WWII is by now regarded as one of the most significant economic development of the twentieth century. In the last decade, the services sector has risen to nearly 80% of developed nations' economic activity, up from 60% more than fifty years ago, a reflection of a variety of forces including the rising standard of living. While the sheer size of the services sector emerged immediately after the WWII, it was only around the mid-1960s that the economics profession began to realize the significance of this shift and its broad implications.

The realization started with Kuznets (1966) who featured the process of structural change from goods to services as an important stylized fact of the post-war economic growth of developed nations. Fuchs (1964, 1965, 1967), in a series of contributions as part of the NBER research program, provided a substantial documentation on the development of services in the U.S. economy, the identification of some of the underlying factors and its impact on the productivity performance. Baumol (1967), in what can be regarded as an extension to Fuchs (1964), introduced the 'cost disease' phenomenon. This notion characterizes the situation of technologically stagnant sectors, such as services, which experience above average cost and price increases, take a rising share of national output, and slow aggregate productivity growth. Fuchs (1968) and Baumol (1967), in their study of employment growth in the U.S. from the late 1930s to mid-1960s, argued that more than half of the growth in service employment could be explained by the lagging productivity of services—arguably a significant impact.

This characterization of services as productivity laggards, while manufacturing still regarded as the engine of growth, can be considered as a contemporary offspring of an old debate that has roots stretching back to work of Adam Smith (1776). The end

result of this widely held view was a prolonged lack of urgency in dealing with conceptual challenges related to services combined with a status quo in the business model of the statistical system. Much of the efforts were focused on the goods-producing industries, while data on service-related industries were sparse. With a size that shrank to less than 20%, manufacturing was still represented with nearly 500 industries in the Standard Industrial Classification (SIC), which has been in use since the 1930s, revised occasionally, but never updated to reflect fundamental structural change. In contrast, the services sector was under represented, with much of its dynamic industries buried as part of the 'not elsewhere classified' industries (see Ambler 1998). As a result, either services sector data in national accounts and productivity statistics did not cover the industries or output was measured with data on inputs or input costs, thus reducing the reliability of productivity measures.

2.2. The Services Sector Through the 'Age of Diminishing Expectations'

For nearly three decades, stretching from the late 1960s all the way to the early 1990s, the whole issue about the measurement of the services sector output went through an 'age of diminished expectations,' largely due to the appearance of more pressing public policy issues, such as the impacts of the successive oil chocks during the 1970s, the persistence until the mid-1990s of a stubbornly high inflation and unemployment rates alongside unsustainable deficits. From 1947 to 1973, the U.S productivity advanced at 3.3 and 2.6 percent per year for the business and manufacturing sectors, respectively. Since 1973, however, trends have been lower, causing the U.S. to experience a major and broad based productivity slowdown (See table 1).

The post-1973 period shows a major divergence between the trends for manufacturing and business sectors. While manufacturing was generally less affected by the slowdown between 1973 and 1979, the divergence intensified in the post-1979 period with the result that manufacturing productivity returned to its pre-1973 performance. A closer look at the data in the post-1973 period suggests that productivity languished in the non-manufacturing sector—the bulk of which is accounted by services.

Table 1. Labour Productivity for U.S. Major Sectors, Average Annual Growth Rate (%)

	1947-1999	1947-1973	1973-1979	1979-1990	1990-1999
Business sector	2.5	3.3	1.4	1.5	2.0
Manufacturing sector	2.8	2.6	2.1	2.6	4.1

Source: Dean and Harper (2001), Table 2.1.

A further proof that the situation of measurement in the services sector did not receive the deserved attention is given by the outcome of the high profile Review of Productivity Statistics appointed in the late 1970s by the Committee on National Statistics of the National Academy of Sciences (NAS). The panel, chaired by Albert Rees, wrote a report (NAS 1979) making twenty three recommendations to government statistical agencies, none of which was aimed at improving the measurement of the services sector output. One possible explanation resides in the fact that research on the services sector was still in a primitive stage, revealing no major breakthrough since the earlier attempts by Fuch and Baumol in the mid-1960s. Obviously, there was back then Hill's (1976) contribution on the taxonomy of services. However, with too much emphasis on the complexity of services, compared to the apparent straightforward nature of goods, Hill may have inadvertently contributed to maintain the existing status quo in official statistics. All along, the services sector, either as a major shift in the economic structure or as a primary source of the productivity slowdown, was put to rest by the economic literature.

The late 1980s constitute a watershed period marked by two landmark contributions on the role of measurement errors—most of which related to the services sector development—in the productivity slowdown. First, Robert Solow's (1987) with the off-hand remark "*We see the computer age everywhere except in the productivity statistics*" in a book review for the New York Times triggered a wake-up call that set in motion a large wave of awareness on measurement issues. In hindsight, Solow's statement brought to light new measurement issues—such as those related to information technology, while emphasizing some old ones—those ascribed to the measurement of the services sector output, which happened to be a large user of information technology.

Quite independently though from Robert Solow, Bailey and Gordon (1988) provided the first serious attempt to tackle the 'new' and 'old' measurement issues alluded to by Solow. They pointed out the startling divergence in the productivity trends between manufacturing and business sectors which contrasted markedly with the abundant anecdotal evidence of remarkable changes in the nonmanufacturing sector, particularly in industries like finance, insurance and real estate, retail, transportation and construction.

Bailey and Gordon came to the conclusion that measurement errors are not the whole story of the productivity growth slowdown. They explain 'some, but not much' (p. 348) for two primary reasons: First, some of the industries subject to measurement errors sell much of their output to other businesses, so that measurement errors in those industries have less effect on aggregate productivity statistics. Second, there were measurement problems in earlier periods also—growth was understated in the post-1973 period, but it was also understated before. While productivity statistics have been underestimated prior to 1973, measurement errors have been getting worse since 1973, particularly in the services sector.

2.3. The Period of 'Creative Destruction'

The situation in the 1990s got worse before it got better. By the mid-1990s, while there was little indication that the two-decade long slump in productivity growth was ending, the performance still remained below the pre-1973 record, largely the result of nonmanufacturing which continued to drag down the overall business sector productivity growth (see Table 1).

The use of questionable industry measures of output combined with the consensus around the presence of an upward bias in the consumer Price index (CPI) that spread to productivity statistics all the way back to 1988 triggered a credibility crisis of the U.S. statistical system. A flurry of research studies aimed at the reliability of the productivity statistics emerged around that time, most notably Gordon (1995) who, in light of the new evidence about the CPI bias, concluded that Bailey and Gordon (1988) may have underestimated the importance of measurement errors. He argued that while measurement errors are not the whole story behind the productivity slowdown, they are large enough to easily lead to a downgrade of the official estimate by a factor of two. The other part of the explanation stems from structural change illustrated by the 'depletion' of the efficiency possibilities in some industries (e.g. air transportation, utilities and food retailing) and by the surge of low-paid jobs in others (e.g. retail trade, restaurant and accommodation).

Similarly, Corrado and Slifman (1996) voiced concerns about the reliability of the trends in the official productivity series, mainly to suggest that productivity growth for the business sector of the economy has been understated. The concerns about possible underestimation of productivity growth have been focused on the services components of that sector where industries showed negative productivity growth over long-periods, a

counterintuitive result if one were to interpret productivity growth solely as technological progress.

It is important to note that the mid-1990s have also seen a significant accumulation of research relevant to productivity measurement that had not yet been reflected in productivity statistics. The problematic industries identified by Bailey and Gordon (1988) have witnessed promising developments illustrated by Oi (1992) and Betancourt and Gautschi (1993a, b) in retail, Fixler and Zieschang (1991, 1992) in banking, Diewert (1995) in insurance, Pieper (1991) in construction and Gordon (1992) in transportation. Although sometimes controversial, these developments contributed to build a momentum favorable to the reconsideration of measurement in the services sector. But without similar efforts in data development, the progress in the literature runs the risk of not making effectively its way into official statistics. The bleak prospect offered back then by the data situation in official statistics was nicely summarized by Griliches' (1994, 10) in his presidential address to the American Economic Association:

> *'Why don't we know more after all these years? Our data have always been less than perfect. What is it about the recent situation that has made matters worse? The brief answer is that the economy has changed and that our data-collection efforts have not kept pace with it. "Real" national income accounts were designed in an earlier era, when the economy was simpler and had a large agricultural sector and a growing manufacturing sector. Even then, a number of compromises had to be made to get measurement off the ground. In large sectors of the economy, such as construction and most of the services, government, and other public institutions, there were no real output measures or relevant price deflators. Imagine a "degrees of measurability" scale, with wheat production at one end and lawyer services at the other. One can draw a rough dividing line on this scale between what I shall call "reasonably measurable" sectors and the rest, where the situation is not much better today than it was at the beginning of the national income accounts.'*

Along the way, Griliches (p. 14) raised the interesting question as to why similar pleas for data development made in the past by high profile commissions and committees only led to modest progress. He offered three possible reasons: 1) Complexity in measurement; 2) Lack of influence by economists on policy makers to secure funding for statistical initiatives and 3) Inadequate training of students on issues of interest to data construction. With the benefit of hindsight, it is worth discussing the respective merits of these explanations to gain a better understanding on where things

fell apart for the U.S. statistical system, how the situation improved ever since and what kind of broad implications can we draw about the situation in Europe.

While we cannot undermine the importance of the first reason, we do not think that it played a decisive role. At best, there may have been a long lead time in the uptake by the literature on issues surrounding the measurement of services sector output before a 'critical mass' has been achieved around the early 1990s, when this issue became high in the public policy agenda. Even so, we have witnessed path breaking contributions in hard-to-measure areas, such as insurance and banking, as early as the late 1970s (see Hirshhorn and Geehan 1977; Geehan and Allen 1978). The third reason does not stand the test of scrutiny either. The number of new economic data bases that appeared since the 1990s on developing and emerging countries, combined with the importance gained by applied research in academic journals, is a good counter-example to the argument that the new generation of students is necessarily worse than the previous ones as far as competencies in dealing with data issues are concerned.

There is, however, some truth about the second reason. It is one thing to produce policy-relevant research. However, it is another thing— far from being trivial—to convince policy-makers in securing funding in the prospect to enhance official statistics. Generally, policy-makers tend to react under one of the following two scenarios (or both but this rarely happens): First, a major credibility crisis with a huge negative media impact like the one occurred in the U.S. in the early 1990s;[4] Second, the presence of a high-profile personality with the stature, credibility and decisiveness that is required to 'have clout' in Washington.

Krugman (1993) offers an interesting perspective on the way in which clouting of policy-makers has evolved over the years. He basically argued that those days when 'professors', with the profile of Paul Samuelson or Robert Solow, were near the center of the policymaking process and being listened to by politicians are long gone. This

[4] The best example is perhaps the devastating and highly publicized 1994 Business Week article by Michael Mandel who argued that: *"The economic statistics that the government issues every week should come with a warning sticker: User beware. In the midst of the greatest information explosion in history, the government is pumping out a stream of statistics that are nothing but myths and misinformation."* (p. 110-118). The credibility crisis also came from public policy users of the data. The fascinating verbatim account provided by Anderson and Kliesen (2010) of the public transcripts of the Federal Open Market Committee illustrates quite remarkably the hard stances taken by Greenspan about the poor state of productivity statistics. For example, at one of the meeting during 1994-1995, he claimed: "*One would certainly assume that we would see this in the productivity data, but it is difficult to find it there. In my judgment there are several reasons, the most important of which is that the data are lousy*." (p. 139).

development, which coincided with the productivity leveling off and the resulting stagnation of standards of living for the first time since WWII, led to situations where political pressures of that time urged for an immediate policy response. At that point, politicians turned away from 'professors', who had a better grasp of the issues at hand, and started to turn to the easy response of 'policy entrepreneurs.'

In the absence of 'professors' or 'policy entrepreneurs,' the void was filled by Alan Greenspan who forcefully argued that the 'thermometer' was simply not reliable to effectively conduct policy. In his 1994 statement before members of the House of Representatives, he eloquently summarized the issue at hand (Greenspan 1994):

> *'There has never been a time when economic understanding was all-encompassing, activity was measured with unerring precision, and forecasting was flawless. The critical question facing the current generation of policymakers—and that appears to have motivated this hearing—is as follows: Has the pace of technology, which has substantially integrated world economies and brought many new products to market, significantly impaired our understanding of how the economic system works, how available data relate to the true economy, and how policy should be implemented?.... When forming an assessment of the economy's structure, we have to recognize that the economic outcomes of human decision making—spending, production, asset holdings, and prices—are measured imperfectly, adding noise and, in some instances, systematic biases to reported statistics. From the viewpoint of an analyst, such as myself, who has spent much of his career closely tracking the regular cycle of economic releases, the list of shortcomings in U.S. economic data is depressingly long. There are biases in aggregate price indexes, incomplete reporting of international transactions, a significant amount of mere interpolation in the service portion of our national income accounts, uneven coverage of the financial accounts of households and firms, and unreported economic activity.'*

With the Chairman of the Federal Reserve Board championing the idea for a major investment in the statistical system to address a number of gaps, the U.S. experience was in that respect unique and contrasted markedly with the situation in other major developed nations where public crises—and not 'professors', let alone the Chairman of the Central Bank—generally represented the main vehicle through which issues related to the crumbling state of the statistical system are addressed. Europe of the 1990s was an exception. As we shall see, the enhancements to the statistical system were primarily driven by policy-makers, a rather top-down process that has the merit to expedite to a large extent the upgrades of official statistics.

2.4. The Situation in Europe—the 'Love Affair' Between Policy and Statistics

The second half of the 1990s was a period when Europe gathered all the necessary conditions for the 'renaissance' of its statistical system, though the process was different from the U.S. The U.S. have witnessed a bottom-up process that started with the consensus reached by the economics profession about major data gaps and culminated with the leadership in the high ranks of the Government who championed the notion that major public investments in the statistical system were badly needed. In contrast, the process in Europe was rather top-down, driven by the need to provide the newly established policy institutions (i.e. the Council, the European Commission and the European Central Bank) with harmonized and reliable information on a wide range of statistics necessary for the conduct of economic and social policy in Europe and the euro zone (e.g. . members' contribution to the European Union budget, economic convergence, etc.). De Michelis and Chantraine (2003, 139-140) summarize as follows the situation back then:

> *'A quick read through the political events of 1992 to 1998 is enough to form a good idea of the huge amount of pressure statisticians were working under during this period. They were already used to statistical indicators being employed for the administrative management purposes of own resources based on GNP. The Maastricht Treaty added to this the now (in)famous Maastricht convergence criteria. Economic convergence prior to the introduction of the single currency was to be achieved through controlling public deficits and inflation. Public debt, interest rates, exchange rate fluctuations and the balance of payments were all to be monitored. … A protocol to the Maastricht Treaty laid down the arrangements for calculating public deficit and public debt as defined in the European system of integrated accounts (ESA). The denominator had to be harmonised. The immediate upshot of this was a proposal to the Council that the ESA become compulsory in each Member State as the only means of avoiding the 'number wars'.*

A large effort to enhance the availability and reliability of economic statistics translated into a vast survey taking initiatives in a number areas including the services sector, price statistics and various reference manuals (e.g. ESA95, the 'Harmonised Index of Consumer Prices', etc.) with a mandatory status as a way to achieve concrete outcomes. With the inception in 1997 of the "Stability and Growth Pact" by the European Council, a greater emphasis was placed on reliable and harmonized information on constant prices growth as a way to enforce this policy. This effort led to the creation around that period of a Task Force on 'Volume Measures' with three objectives in mind (see Konjin 2002): First, define a wide range of methods leading to

the construction of constant price series across member states; second, identify significant data gaps in the services sector that call into question the reliability of the estimates of economic growth and, third, recommend a framework for further work on price and volume measures.[5] The vast research effort that resulted led to the identification of best practices around the world on 'hard-to-measure' issues and the development of a framework based on A/B/C methods.

The 'Handbook on Price and Volume Measures in National Accounts,' published by Eurostat in 2001 (Eurostat 2001), is the direct outcome of these efforts to enhance constant price measures carried out by Europe.[6] While generally many commission reports around the world languish on dusty shelves, in the case of the European Commission a Regulation is generally prepared that emphasizes the mandatory status of the initiative. The 'Handbook' was no exception and its Regulation also specified a timetable of implementation for methods A and B and a gradual reduction of methods C over the 2004-2006 timeframe.

While the developments that have taken place in the U.S. may have facilitated the rapid expansion of various initiatives in services in the European statistical system, the presence of 'endogenous' forces represented by a well-established capacity in some member states, the experience learned through the pitfalls in some national experiences as well as the recommendations of some Reviews initiated by national governments may have made a significant contribution.

For example, the role of the UK statistical system has been instrumental to that effect simply on the basis of the number of reviews commissioned. Following policymakers concerns about the quality of macroeconomic statistics during the 1980s, described by Nigel Lawson (1992, 845) the then Chancellor of the Exchequer as "little more than a work of fiction", the Government commissioned the 1989 Pickford Review

[5] This framework is based on the A/B/C classification for methods (A, B and C stand, respectively, for good, acceptable and unacceptable methods).

[6] In this handbook, deflation methods are graded according to one of three alternative classes, from the best (A methods)—the one that provides the closest approximation to the ideal; the second-best (B methods)—which provides an acceptable alternative to the A method, in the absence of the latter; to the worse (C methods), clearly not recommendable. The A methods make use of output deflators that meet requirements in terms coverage (comprehensive coverage of products), valuation (basic prices), account of quality change and conceptual consistency with national accounts. While B methods do not generally respect all of the above criteria that A methods meet, it would include the use of direct detailed volume output indicators. C methods meet none of the four requirements. They rely on direct volume indicators which are not detailed; input methods; secondary indicators; and general price indices.

(Pickford 1989) which emphasized that the statistical system is no longer in line with the changing structure of the economy (see the discussion by Egginton et al. 2002). As a follow-up to the recommendation of this Review, a large survey taking effort on the services sector was initiated in 1992 that ultimately gave rise to an enhanced coverage of services industries and better deflators to arrive at reliable constant price series (see Drew and Morgan 2007).

The 2004 Allsopp Review (Allsopp 2004), while stressing the need for more efforts in the statistical infrastructure (better integration in the survey operation and data collection efforts by the UK Office for Nations Statistics (ONS) and other government departments), reiterated the importance for the statistical system to adequately reflect the changing structure of the economy. This has materialized with a recommendation on the development of macro-economic statistics for the services sector brought forward under various existing programs such as the Index of Services development program, the national accounts reengineering programme and the development of the Corporate Service Price Index—the ancestor of the SPPI (see Tily 2006).

3. The 'Renaissance' of the Services Sector Productivity Statistics

The foregoing review emphasized a clear need to update, extend and integrate data underlying productivity statistics in both Europe and the U.S. Although over time the existing productivity statistics programs have addressed users' needs in areas such as manufacturing, there have been significant gaps attributable to the absence of adequate source data, adequate coverage of nonmanufacturing and data integration. As the economy gradually shifted to services, it became clear that important sources of economic growth were omitted from the available productivity statistics. Lacking comprehensive, reliable and integrated data, economists often had to compile their own data sets to address the specific issues that interested them.

3.1 Framework and Data Requirements

A production account suitable for growth accounting must typically conform to four building blocks, meant to be the minimum requirements needed to achieve a certain reliability.

The first requirement is represented by the representation of a production account that begins with the structure of the Input-Output Tables that accommodate all required inputs in both current and constant prices. The benefits of this approach are

twofold: 1) First, it makes it possible to use alternate productivity measures that meet a variety of users' needs—gross output, sectoral output and value added variants of multifactor productivity measures; 2) Second, to the extent that the framework has several identities that serve as quality assurance safeguards, the internal consistency of the data can be assessed. Examples of these include the supply-use identity, the identity between the final demand-GDP and the sum of value added in both current and constant price, the consistency in the sectoral allocation of the aggregate productivity growth across the variety of output measures. Ideally, the set of tables must offer a minimum of consistency over time to support long-term trend productivity analysis.

The second requirement is about the industry and product classifications, which both need to reflect adequately the current structure of the economy represented nowadays by a shift towards the services sector, the predominance of high-tech products and services for both output and inputs, but also investment, hours and compensation.

Third, a source data that supports the variables, in both current and constant prices, required by the Input-Output Tables. This implies a comprehensive set of annual surveys covering the entire economy and the wide array of commodities and services as well as a comprehensive program of producer and consumer prices.

3.2 What Has Been Accomplished to Date?

Since the late 1990s, Europe and the U.S. have moved from a position where there were virtually no initiatives designed to enhance the statistical system in a way to adequately meet the above-mentioned requirements to a position where much of the requirements have been addressed, albeit with some gaps still outstanding.

A. Earlier Progress

First, since 2000, both of the European and the U.S. statistical systems have shifted gradually to the *Nomenclature des Activités Économiques dans la Communauté Européenne* and the North American Industrial Classification Systems, respectively. An important advantage of these classifications over the previous International SIC and SIC is the greater detail available on services and information technology-producing industries, two major structural shifts experienced by these two economies. Timmer et al. (2010) and Triplett and Bosworth (2004) have shown that Europe and U.S. productivity growth has been concentrated in the service industries since 2000, some of which are intensive users of information technology. In contrast, information technology-

producing industries were responsible for the resurgence of the U.S. productivity in the 1995-2000 period (Jorgenson et al. 2010).

The second building block comprises a major expansion in the source data covering a wide-range of areas. For example, in the U.S., the economic census considered as the backbone of the 'best-level' estimate of GDP for the private economy and its constituent industries, experienced substantial enhancements ranging from an expansion of its coverage of shipments, revenues and expenses by industry and commodity and an increased timeliness (move from a decennial to a quinquennial census). In addition, the economic census provided the detailed data used by the BLS to develop weights for the Producer Price Index Program (see Landefeld et al. 2008).

With the expansion of the industries' intermediate purchases content of some of the Census Bureau surveys and their availability on an annual basis, annual estimates of the intermediate input expense and value added have been greatly enhanced by relaxing the assumption that the movement of real intermediate inputs is driven by that of the real output.

The BLS initiated a program to expand the coverage of the Producer Price Index to include the services and to begin publication of an aggregate PPI combining goods and services in the early 2000s. The in-scope service portion of GDP increased from about 10% in 1990, to about 35% in 1996 (covering industries like trucking, telephone communications, real estate agents and managers, operators of nonresidential buildings and legal services) and to 50% by 2001, when industries like property and casualty insurance, life insurance, food stores, security brokers and dealers, retail and wholesale trade were released (Swick et al. 2006). At present, the coverage is over 80% of in-scope service industries (Landefeld 2010, 12).

Europe also developed several statistical initiatives primarily designed to support the development of harmonized economy policies across member states which led, ultimately, to the enviable result of a balanced statistical reporting between goods- and services-producing industries (see Bøegh Nielsen 2005). A harmonized system of (Annual) Structural Business Statistics has been developed with the goal of collecting information on a wide range of variables (e.g. value added, purchased goods and services, investment, employment, gross operating surplus, labour cost, etc.) from almost the entire business universe covering a significant level of industry detail for

industry, construction and services sectors.[7] Given its scope, the SBS appears to be the counterpart of the U.S. Economic Census with the important difference that it has an annual frequency.

A number of sectoral statistical initiatives have been launched with a goal to supplement the information collected by the SBS. This was particularly the case for services where information on outsourcing and subcontracting which has been addressed by the Business Services Statistics.[8] This survey provides information on service providers, types of service purchased, the location of the main service provider, barriers to purchasing services and so forth.

The need to develop an SPPI program has been taken seriously by some European countries as early as the mid-1990s. For example, the UK has developed a pilot-program then known as the Corporate Service Price Index. Data for this program have been collected since 1991-1992 on five industries, then increased to 12 and culminated to 22 in early 2000 (Pegler et al. 2010). Sweden followed suit in the 1990s with the development of three indexes (hotel services, domestic air transport services and non-residential property rent), a number that jumped to more than 30 since 2000 (Fridén et al. 2010). Despite these early efforts, it was only until 2005 that the European legislation on services has been amended to account for a limited set of the SPPI covering the following activities: selected transport services, all post and telecommunications, all computer and relates services and all other business services. [9]

A realistic assessment of the progress in the development of an SPPI for Europe suggests the presence of some significant gaps in terms of scope and availability, which raises some reasonable doubts on the progress of deflation methods at the European level (more on that below, in the sub-section on recent developments). Although the UK

[7] More information is available at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Structural_business_statistics_introduced

[8] Information of transportation is compiled from a variety of administrative sources.

[9] Transport services include the following subset of industries : Freight transport by road; Sea and coastal water transport; Scheduled air transport; Cargo handling and storage and warehousing. Post and telecommunication includes: Post and courier services and Telecommunications. All computer and related services includes: Hardware consultancy; Software consultancy and supply; Data processing; Database activities; and Maintenance and repairs of office and computing machinery. All other business activities includes: Accounting, book-keeping, legal activities, auditing, Consultancy, etc.; Architectural and engineering activities, technical testing; Advertising; Labour recruitment and provision of personnel; Investigation and security activities; Industrial cleaning. See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Services_producer_price_index_(SPPI)

and Sweden should be regarded as a good practice in Europe, their SPPIs, despite its national statistics status, does not cover at this point the full suite of market services industries. The index published by Statistics Sweden covers only 70% of this sector (Fridén et al. 2010), by far larger than the coverage of the Office for National Statistics' index based on only 32 industries (Pegler et al. 2010). Activities for distributive trade, finance and real estate have been excluded, thereby leaving a significant portion of the services sector with perhaps inadequate deflators.

Industry coverage notwithstanding, progress across Europe has been surprisingly uneven, if not puzzling, on the basis on indexes released by Eurostat at the time of writing this paper (see Table A.1 in the Appendix).[10] The conundrum applies not only to small countries but also to major ones like Germany, France, Italy and the UK. Out the 27 set of SPPIs published by Eurostat from 2009 onwards, Italy had a 7% coverage (in terms of number of indexes), Germany and UK slightly less than 50%, while France about 56%. Therefore, even for industries supposedly being covered by adequate deflators, they may vary in terms of quality as a result of a wide range of coverage across major member states.

The final building block represented by the adequate statistical infrastructure that ensures a minimum consistency across variables and between 'top-down' and 'bottom-up' approaches to multifactor productivity growth. In the case of the economic accounts, this infrastructure is represented by the Input-Output Tables. While the well-established tradition of Input-Output Tables in the majority of European nations' statistical system has made its way in the development of the European statistical system,[11] the story was somewhat different for the U.S. where the Input-Output Tables experienced various fortunes.

For example, measures of industry value added from the benchmark and annual Input-Output accounts and from the GDP by industry accounts have been prepared by the BEA for many years. However, they were inconsistent with one another. The inconsistency in the measures of value added by industry—as well as in the underlying industry measures of gross output, intermediate inputs, and income components of value added—reflected the use of different methodologies and different source data. These inconsistencies had made it very difficult for users of industry data to relate Input-

[10] See Table A.2 in the Appendix of the U.S. industry coverage of the SPPI.
[11] Since 2002, the European System of Accounts (ESA95) has established a compulsory transmission of annual supply and use tables.

Output information on interactions among producers and between producers and final users to the GDP-by-industry information on the income components of value added and on price and quantity indexes of value (see Lawson et al. 2006).

B. Recent Progress

i) Towards More Integration in the U.S. and Better Measures of Real Output

Through an enhanced reliance on the Input-Output Tables, BEA has considerably improved the integration of the various components of the core accounts in an attempt to make the annual industry accounts more reliable and internally consistent across industries and variables.

With the 2004 Comprehensive Historical Revision, BEA released integrated industry accounts for 1998-2002. This release marked the introduction of a new estimating methodology that eliminated the inconsistency in the two measures of industry value added and improved the accuracy of both accounts. For the first time, both sets of accounts were prepared with fully consistent measures of gross output, intermediate inputs, and value added by industry. In addition, the new methodology imposed time series consistency on the annual Input-Output tables so that they will be more useful for analyses of trends over time (see Moyer et al. 2004; see also Rassier et al. 2007). These efforts towards more integration continued with the 2010 Comprehensive Historical Revision (Mayerhauser and Strassner 2010).

With these changes, the BEA Annual Industry Accounts have become an important building block of an integrated production account suitable for the growth accounting exercise. Their use as the primary source for the 'KLEMS Inputs' dataset (see Strassner 2005), the 'Integrated GDP-Productivity Accounts' (see Harper et al. 2008) and the U.S. component of the European Union-KLEMS (see Timmer et al. 2007) data is a reflection of their increasing relevance.

The 2004 and 2010 Comprehensive Historical Revisions have also improved the measurement of output of banking, insurance and distributive trade industries and made them closer to the SNA guidelines. The change to the insurance output, which recognizes the implicit services that are funded by investment income, has the advantage of eliminating the large swings that insurance output thas generally result from disasters (see Chen and Fixler 2003). The change to banking allocates a portion of the implicit services of commercial banks to borrowers, a recognition that both

borrowers and depositors receive these services which elimininates the overstamement of the services furnished without charge to depositors (see Fixler, Reinsdorf and Smith 2003). Another enhancement resides in the use of direct measures of margin price change in deflating the gross margin output in retail and wholesale instead of the proxy based on a combination of the average margin rate and componenents of the consumer price index of the producer price index which tended to over estimate real output growth of these two industries (Mayerhauser and Strassner 2010).

ii) Towards More Reliable Deflation Methods in Europe

How much progress have European deflation methods experienced following the expansion in the European service statistics and the prescription to move away from the so-called C-methods? Table 2a, based on the information on the state of measurement practice compiled by Eurostat, quantifies for each major services sub-sectors the extent to which A/B/C methods have been used and how the picture evolved before and after 2006.

Table 2a. Conformity of Components of the Market Services Sector to Eurostat's Handbook: European Union (percentage of value added)

	Sectoral share	Post-2006			Pre-2006		
		A-Method	B-Method	C-Method	A-Method	B-Method	C-Method
Distribution	21.0		100			60.0	40.0
Hotels and restaurants	3.4	75	15		1.2	51.0	49.0
Transport and communication	10.8	25	59	16	10.0	69.0	31.0
Business services and finance	40.3	3	50	47	0.5	10.0	90.0
Other services	24.6	5	70	25		50.5	49.5
Market services	**100.0**	**7.7**	**65.2**	**26.8**	**1.3**	**38.2**	**61.8**

During the pre-2006 period, the results suggest that C-methods dominated the market services sector with 62% of value added followed, followed far behind by B-methods with 38%, while A-methods were in a distant third position with a negligible 1%. There is, however, a great deal of variation across sub-sectors. Output of business services and finance, which accounts for 40% of market services, rests primarily on C-methods. Other services, the second largest component of the services sector, rely heavily on C-methods, albeit not to the same extent as business services and finance. In contrast, B-methods are dominant only in distribution and transportation and communication, accounting for slightly less than 1/3 of the market services sector.

These results show that the share of C-methods is twice as much higher than that reported by Timmer et al. (2010, 90-94) on the basis of the information on the state of measurement practice compiled by Eurostat in 2000. While a full reconciliation between these two sets of results is beyond the scope of the present study, differences in the information vintage are such that comparisons other than qualitative can be misleading. Using the ranking of sub-sectors according to the importance of the C-methods, the two studies show marked differences in the ranking of transportation and communication and hotels and restaurants, contrasted with close similarities for business services and finance, distribution and other services, altogether accounting for more than 4/5 of the market services sector value added.

It is instructive to enquire at this stage whether, on average, industries with relatively better measures of output report above-average productivity trends. While there are various ways to address this question, the available information lends itself to the estimation of a production function with capital and labour inputs augmented by a set of dummy variables that control for the quality of the industry output based on the basis of A/B/C grading methods. The estimation of this quasi-hedonic production function offers the advantage to assess the impact of these quality indicators directly on industry output and, indirectly, on their corresponding multifactor productivity trends.[12] The results reported in Table A.3 in the Appendix tell an interesting tale.[13] Industries with output measures based on A or B-methods report above-average output trends and, hence, more rapid productivity growth rates. Unlike their B-methods counterpart, the results based on A-methods are not statistically significant, a reflection of the limited number of industries that employed A-methods.

[12] We considered the following functional form: $\ell nQ_{it} = \alpha + \beta_A D_A + \beta_B D_B + \beta_K \ell nK_{it} + \beta_L \ell nL_{it} + \epsilon_{it}$ where D_j is a dummy variable referring to quality $j = A, B$ in the measure of industry output. The parameter α captures multifactor productivity and the effect of the reference case taken to be the grading for the C-methods. The other variables have the standard definition. Our dataset combines value-added time-series over the 1970-2006 period for a set of 5 sub-sectors corresponding to those identified in Table 2 giving rise to a panel of 180 observations. The production function was estimated using the Pooled Mean Group method which extends the error correction modelling framework to the panel dimension (see Pesaran et al. (1999)). This technique imposes homogeneity restrictions on the long-run parameters and derives the error correction coefficient and the other short-run parameters of the model by averaging across groups. The estimation was carried out using both the raw data and on the cross-sectionally de-meaned data. Both sets of results show a high and significant impact of output quality indicators on output.

[13] Table A.2 presents the long-run coefficients and the error correction term. The estimation was carried out using both the raw data and on the cross-sectionally de-meaned data, equivalent to including time dummy variables in standard panels. Both sets of results show a high and significant long run impact of capital and labour, with point estimates suggesting the presence of constant returns to scale. The results are also consistent with respect to the sign and significance of the dummy variables and the measure of multifactor productivity trend.

Moving now to the post-2006 results (Table 2a) which suggest considerable progress with a little less than 75% of market sector value added deemed reliable, a major turnaround from more than 1/3 reported in the earlier period. This enhancement, which came at the expense of a significant downgrade of the share of C-methods, from a little less than 2/3 of value added to ¼, is generally broad-based. Except for business services and finance, where almost half of the output relies on C-methods, the remaining sub-sectors, accounting for 60% of the market services sector, employ reliable methods.

While certainly encouraging from the perspective of gaining more reliable productivity trends, these results suggest the presence of a wide range of practices across member states, with some countries, like Netherlands, representing some of the best-practices with a lower share of C-methods and higher shares of A- and B-methods consistently across the two periods.[14]

Contrasted with the results for Europe during the pre-2006 period, there is an indication that the good practice of some member states like Netherlands has been pulled down by that of some large countries such as UK and France, where C-methods account for more than half of the market economy output. The shift away from C-methods between the two periods in Europe seems to be consistent with that observed in the sample member states, an indication of the appearance of a common level playing field both in terms of the scale and pace of enhancements in the deflation methods across member states.

While this shift away from C-methods in Europe s nothing short of remarkable, it does not stand the test of scrutiny. First, how can we possibly get so much reduction in the share of C-methods for some sub-sectors when the SPPI was certainly not in a position to support a progress in such order of magnitude within the time-frame given to member states? On one hand, the SPPI became mandatory only in 2005 (see above), while, on the other hand, member states were required to reduce the share of C-methods by 2006.[15] Clearly, there is a synchronization issue which begs the question as to how Europe has been able to enhance its deflation methods.

[14] See De Boer (2007) for Netherlands, Marks et al. (2007) for the UK and INSEE (2007) for France.
[15] I am indebted to Steve Drew, Office for National Statistics, for bringing this point to my attention.

Table 2b. Conformity of Components of the Market Services Sector to Eurostat's Handbook (percentage of value added): Sample of Member States

A. Netherlands							
		Post-2006			Pre-2006		
	Sectoral share	Method A	Method B	Method C	Method A	Method B	Method C
Distribution	28.6	0.5	99.5		0.5	99.5	
Hotels and restaurants	4.6	74.2	25.8		74.2	25.8	
Transport and communication	18.6	45.6	46.7	7.7	20.7	63.7	15.6
Business services and finance	48.1	10.6	47.3	42.1	3.2	37.2	59.6
Market services	**100.0**	**17.2**	**61.1**	**21.7**	**9.0**	**59.5**	**31.6**
B. United Kingdom							
	Sectoral share	Post-2006			Pre-2006		
		Method A	Method B	Method C	Method A	Method B	Method C
Distribution	21.3		100.0			70.0	30.0
Hotels and restaurants	5.3	95.0	5.0			65.0	35.0
Transport and communication	13.3	30.0	65.0	5.0	20.0	65.0	15.0
Business services and finance	49.3	10.0	50.0	40.0	2.0	12.0	86.0
Other services	10.7	6.0	80.0	14.0	3.0	68.0	29.0
Total services	**100.0**	**14.6**	**63.5**	**21.9**	**4.0**	**40.2**	**55.8**
C. France							
		Post-2006			Pre-2006		
	Sectoral share	Method A	Method B	Method C	Method A	Method B	Method C
Distribution	25.2		100.0			76.2	23.8
Hotels and restaurants	5.6	74.7	25.3			57.1	42.9
Transport and communication	15.2	45.6	52.3	2.1	17.8	60.1	22.1
Business services and finance	54.0		59.2	40.8		9.8	90.2
Total services	**100.0**	**11.1**	**66.5**	**22.3**	**2.7**	**36.8**	**60.5**

Second—and this provides some answers to the issue raised in the first point—a number of member states, like France (INSEE 2007, Chapter III), UK (Marks et al. 2007, Appendix 8A) and Netherlands (De Boer 2007, section 8), to name a few, are still using the CPI for distributive trade, considered as being part of B-methods according to the Eurostat guidelines and, at best, misleading according to the literature (see Triplett and Bosworth 2004, chapter 8, for a nice discussion).[16] Third—notwithstanding the above mentioned points—the European Regulation with respect to deflation remained

[16] Germany resorted to a large number of components of their existing CPI program to deflate a number of services commodity output (see *Statistisches Bundesamt* 2003, Appendix A).

conspicuously silent as to how far back member states should carry the reduction in C-methods. To the best of our knowledge, the absence of guidelines in this area can potentially give way to a wide range of practices and, hence, to a great deal of uncertainty in the point estimate of the long run productivity trend.[17]

The main take away message out of this exercise is that, despite the existence of some good practices, the European market services sector real output can be largely considered as unreliable during the pre-2006 period, a result of faulty measures of output in business services and finance and other services which account for 2/3 of the market services sector. Officially, considerable improvements have been accomplished, with A/B methods accounting for close to ¾ of the market sector output during the post-2006 period, compared to 40% in the early period. The enhancements are broad-based, except for business services and finance where the C-method remains non-negligible. However, with a careful assessment using a set of independent indicators, we are of the opinion that this progress has been overestimated.

4. Productivity Growth in the Services Sector: 'Roughly Right, Precisely Wrong,' or Getting Reasonably More Reliable?

4.1 Setup

Enhancements to the source data, concepts and methods in both Europe and the U.S. led to significant upgrades in the measurement of output and intermediate inputs in both current and chain-type volume indexes. The benefits of some of these efforts are represented by less reliance on imputations, extrapolations and input price indexes for deflation as well as a more frequent update in the weights of price indexes. This is another way of saying that the reliability of the estimates has been improved. The immediate question is 'by how much.'

While admittedly this represents a difficult question, we chose to tackle it using the multifactor productivity trend over a sufficiently long period as a yardstick with, however, all the necessary cautionary caveats. As an indicator of technical change, multifactor productivity is expected to report positive trends, particularly over long periods. A negative trend is, however, always possible under the following two circumstances.

[17] According to Steve Drew, UK went as far as far back 1994—clearly a good practice. We have not been to determine what exactly other member states have done.

First, the assumptions—constant returns to scale, competitive markets and full capacity utilization—underlying the multifactor productivity measures are violated. For example, if during cyclical downturns, businesses cannot adjust accordingly their inputs for reasons related to labour hoarding or irreversibility of capital, then multifactor productivity can display a negative trend. The same can occur in the presence declining economies of scale and a deterioration of market shares as a result of intense global competition as we saw it happening in some specific industries such as textile. While there might be good reasons motivating the presence of industries with negative productive trends, this is not likely to occur over very long periods as inefficient businesses are expected, after a while, to exit the industry (see Harper et al. 2010).

Second, if negative multifactor productivity trends persist even after long periods, then this may be an indication of a reliability issue with the underlying data. Under this circumstance, we interpret negative productivity trends as an indication of probable data problems. Output and inputs data might be subject to measurement errors and/or lack of integration (e.g. missing input, dissimilar domains of definition, etc.).

In our attempt to use multifactor productivity trends as a quality control safeguard, we use the measure based on gross output considered to be superior to the one based one value added on two grounds: First, it explicitly accounts for the efficiency that may arise from the use of intermediate inputs, which are substantial in industries such as finance and business services (see Gullickson 1995). Second, although the value added measure is linked to its gross output counterpart through the ratio of gross output to value added, this may lead to substantially different results. This ratio, which varies considerable across industries, potentially distorts the inter-industry comparisons (Gullickson and Harper 1999).

The gross output-based measures of multifactor productivity used in this section correspond to the 2009 vintage of the EU-KLEMS database and cover 27 industries of the market economy over the 1980-2007 period. The gross output approach to multifactor productivity, once hampered by the lack of adequate information on intermediate input flows and service flows between industries (Diewert 2002), has seen its reliability greatly enhanced in recent years with the data development described above in both the Europe and the U.S. and the greater emphasis given to data integration in the U.S.

4.3 Quantifying the Benefits out of Data Enhancements in Services

Over time sectors constituent of the market economy contribute differently to the aggregate productivity trend. These contributions can be quantified using a methodology developed by Domar (1961), which provides a convenient metric of the cumulative effect of all industries on multifactor productivity growth. An important advantage of this approach is to account for the inter transactions across industries with the result that measurement errors in the performance of one industry would have no impact at the aggregate level. This approach has been widely used in the productivity literature (see Jorgenson and Stiroh, for example), including recently by Harper et al. (2010) in an attempt to monitor progress in the U.S. productivity statistics following major upgrades in the data.

We too use Domar's contributions to quantify the cumulative effect of the services sector productivity trends on the market economy productivity performance, particularly during the period where Europe and the U.S. implemented various enhancements to the measurement framework. The results provided in Table 3 confirm some broad facts about Europe-U.S. productivity performance. Examples of these trends include the productivity convergence between the two economies during the 1980-1995 period, followed by a sharp acceleration of the U.S. productivity that contrasted markedly with a deceleration of its European counterpart, translating into a 0.6 percentage point gap during the post-1995 period.

We now move to the question whether the improvements made by both Europe and the U.S. in their concepts, methods and data sources from 1995 onwards have translated into more reliable productivity trends particularly in the services sector. We contrast the results for the pre-1995 period that witnessed the launch of a number of data gap initiatives, with those for the subsequent periods when some of the efforts related to the earlier initiatives were brought to fruition. Also, we split the services sector between industries that consistently make a negative contribution (called 'laggards' hereafter) and those with a consistently positive contribution (called 'dynamic' hereafter) to the market economy productivity trend.[18]

[18] The 'laggards' are generally represented by renting of machinery and equipment and other business activities, hotels and restaurants, other community, social and personal services, private households with employed persons. The 'dynamic' component is represented by retail, wholesale and transport and storage. This broad characterisation, which applies to Europe and the U.S., does not however preclude significant differences in the pace of productivity growth between the two countries.

Table 3. Domar Percentage Point Contribution of Various Sectors to the Market Economy Multifactor Productivity Performance

	1980-2007		1980-1995		1995-2007	
	Europe	**U.S.**	**Europe**	**U.S.**	**Europe**	**U.S.**
Services with a negative contribution	-0.27	-0.21	-0.27	-0.41	-0.29	-0.06
Services with a positive contribution	0.31	0.56	0.32	0.47	0.30	0.75
Manufacturing	0.63	0.66	0.67	0.55	0.58	0.80
Nonmanufacturing	0.18	-0.02	0.31	0.17	0.02	-0.25
Market economy	**0.85**	**0.99**	**1.03**	**0.79**	**0.62**	**1.24**

During the pre-1995 period, the 'laggards' have depressed the European market economy productivity trend by one quarter of a percentage point, significantly lower than the 0.41 percentage point reported by the U.S. With a 0.3 and 0.47 percentage point contribution, respectively, in Europe and the U.S., the dynamic component of the services sector virtually wiped out the negative effect of the laggards, leading roughly to an absence of productivity advance in the market services sector of both economies during this period. During the post-1995 period, the productivity performance of the U.S. services sector left its pre-1995 torpor, advancing at 0.6% annually, while its European counterpart stubbornly stalled.

It becomes clear from these results that the enhancements of all kinds to the U.S. statistical systems have translated into a reduction in the impact of the 'depressing' effect of the laggards and a lift in the contribution of the 'dynamic' component of the services sector. This contrasts markedly with Europe where there seems to be no sign that the enhancements to the measure of services output have made their way to the productivity statistics. This suggests that either the 2009 data vintage of productivity statistics does not yet fully reflect the shift away from C-methods or if it did, this has not effectively translated into more reliable productivity trends, thereby lending support to our skepticism about the scale of the improvement in deflation methods in Europe.

5. Conclusion

The European efforts towards new and expanded source data, harmonization in concepts and methods and data integration unfolded at almost a staggering rate following the erection of the new European institutions which, in turn, triggered a huge appetite for relevant statistics. The recent construction of a production account suitable for growth accounting represented the culmination of these efforts and set in motion an

ambitious research agenda in the wake of the finding that Europe has been lagging to the U.S. productivity performance, particularly in the services sector.

The present paper, meant to assess whether this gap is driven by measurement differences, constitutes a response to this research agenda. It asked three related questions:

First, where does the situation of the measurement of the European services sector output stand at the moment, in comparison to, say, a decade ago when the Eurostat 'Handbook on Price and Volume Measures in National Accounts' was released? While any measure of progress needs the definition of a benchmark, we measured progress not only with respect to the Handbook guidelines at two different points in time but also in reference to the major upgrades experienced by the U.S. statistical system, which established a new frontier in economic measurement.

Second, productivity statistics are only as reliable as the source data, concepts and methods on which they rest. As a backbone of the reliability of productivity statistics, each of these components constitutes a metric through which progress can be assessed. We assessed how the European statistical system fared on these three grounds in comparison to its U.S. counterpart.

Third, the gains in terms of new source data, better concepts and methods translate into less reliance on unreliable techniques such as imputations, extrapolations and other stringent assumptions of all kind meant to overcome paucity in data. The gains can also translate into more reliable productivity trends. Provided that the assumptions underlying the concept of multifactor productivity are not violated, the industry in question does not experience any decline over the long run, then multifactor productivity trends can be valuably used as a quality control yardstick. Hence, any negative productivity trend over a long period of time can be deemed suspect, highlighting questionable underlying data.

The majority of industries that conform to this characterization belong to the services sector and construction industry. Clearly, given its size, the focus of this paper has been on the former where some industries, such as renting of machinery and equipment, reported negative trends over more than two business cycles over the 1980-2007 period.

There have major enhancements to productivity statistics that can possibly be quantified with the split of the 1980-2007 period into the pre-1995 sub-period where major initiatives took place and the post-1995 sub-period when they began to payoff. The gain out of these enhancements is measured in terms of the lift in the aggregate productivity trend due to either to the reduction in the impact of the ‘laggards’—those showing consistently negative productivity contribution—or to an increase in the impact of the ‘dynamic’ component of the services sector—industries that consistently show positive trends.

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Table A.1—Set of Service Producer Price Indexes Published by Eurostat from 2009Q3 Onwards

Industries	EU-15 Member States Shown Without Data
Freight transport by road and removal services	Italy and Portugal
Sea and coastal water transport	Denmark, Ireland, Greece, France, Italy, Austria and Portugal.
Air transport	Denmark, Germany, Italy, Luxembourg, Netherlands, Portugal and Sweden
Warehousing and storage	Italy, Portugal and UK
Cargo handling	Italy, Portugal
Postal and courier activities	Belgium, Portugal and Sweden
Postal activities under universal service obligation	Denmark, Germany, Ireland, Spain, France, Italy, Netherlands, Austria, Portugal and Sweden
Other postal and courier activities	Italy, Portugal
Accommodation	The whole EU 15
Food and beverage service activities	The whole EU 15
Publishing activities	The whole EU 15
Programming and broadcasting activities	The whole EU 15
Telecommunications	Belgium, Denmark, Greece, Netherlands, Portugal and Sweden
Computer programming, consultancy and related activities	Germany, Greece, France, Italy, Portugal and UK
Information service activities	Belgium, Germany, Ireland, Greece, France, Italy, Luxembourg, Netherlands, Portugal and UK
Data processing, hosting and related activities; web portals	Belgium, Denmark, Germany, Ireland, Greece, Italy, Luxembourg, Netherlands, Portugal and UK
Other information service activities	The whole EU15
Legal, accounting and management consultancy activities	Belgium, Greece, France, Italy, Portugal, Finland, Sweden and UK
Legal and accounting activities	Belgium, Denmark, Germany, Ireland, France, Italy, Luxembourg, Netherlands, Portugal, Finland and Sweden
Legal activities	The whole EU15 except UK
Accounting, bookkeeping and auditing activities; tax consultancy	The whole EU15 except Greece and UK
Management consultancy activities	The whole EU15
Architectural and engineering activities; technical testing and analysis	Belgium, France, Italy, Portugal, Sweden and UK
Advertising and market research	Belgium, Denmark, France, Italy, Portugal, Sweden and UK
Employment activities	Belgium, Greece, Italy and Portugal,
Security and investigation activities	Belgium, Italy, Luxembourg and Portugal,
Cleaning activities	Belgium, Italy, Portugal and Sweden

Source: Eurostat.

Table A.2—Coverage of the U.S. Service Producer Price Index Program

Industries	NAICS Code
Merchant wholesalers, durable goods	423
Merchant wholesalers, nondurable goods	424
Material recyclers	429
Motor vehicle and parts dealers.	441
Furniture and home furnishings stores.	442
Electronics and appliance stores	443
Building material and garden equipment and supply dealers	444
Food and beverage stores	445
Health and personal care stores	446
Gasoline stations	447
Clothing and clothing accessories stores	448
Sporting goods, hobby, book and music stores	451
General merchandise stores	452
Florists	453
Nonstore retailers	454
Air transportation	481
Rail transportation	482
Water transportation	483
Truck transportation	484
Pipeline transportation	486
Transportation support activities.	488
U.S. Postal Service	491
Couriers and messengers	492
Warehousing and storage	493

Table A.2—Coverage of the U.S. Service Producer Price Index Program (Continued)

Industries	NAICS Code
Publishing industries, except Internet	511
Broadcasting, except Internet	515
Telecommunications	517
Data processing and related services	518
Internet publishing and web search portals	519
Depository credit intermediation	522
Security, commodity contracts and like activity	523
Insurance carriers and related activities	524
Lessors of nonresidential buildings (except miniwarehouses)	531
Automotive equipment rental and leasing	532
Legal services	541
Employment services	561
Waste collection	562
Computer training	611
Offices of physicians	621
Hospitals	622
Nursing care facilities	623
Amusement and theme parks	713
Accommodation	721
Commercial machinery repair and maintenance	811

Source: http://www.bls.gov/web/ppi/ppitable05.pdf

Table A.3—Pooled Mean Group Estimates (EU-15 Services Industries, 1970-2006)

	Raw data	De-meaned data
α	-0.28 (0.117)	-0.22 (0.094)
β_A	0.58 (0.361)	0.61 (0.381)
β_B	0.48 (0.101)	0.43 (0.088)
β_K	0.31 (0.092)	0.36 (0.103)
β_L	0.63 (0.136)	0.60 (0.119)
ECM	-0.41 (0.037)	-0.83 (0.074)

Note: ECM=error correction model. Numbers between parentheses correspond to standard errors.