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# Arbeitspapiere/ Working Papers

Jochen Hartwig

Productivity Growth in Service  
Industries – Has 'Baumol's Disease'  
Really Been Cured?



# Productivity growth in service industries – Has ‘Baumol’s Disease’ really been cured?

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## Abstract

Since the mid-nineties, U.S. labor productivity outgrows its European counterpart by a wide margin. Several recent studies have found that this result is brought about by relatively few service industries, where productivity growth has accelerated in the U.S., but not so in Europe. Based on this finding, TRIPLETT/BOSWORTH (2003) have asserted that ‘Baumol’s Disease’, according to which imbalances in productivity growth between a ‘progressive’ (manufacturing) and a ‘nonprogressive’ (service) sector of the economy lead to constant expenditure shifts into the latter, ‘has been cured’ – at least in the U.S. The present paper challenges this statement, showing that there is only one genuine service industry with a lasting increase in productivity, namely wholesale and retail trade. Labor productivity in the U.S. retail industry has grown fast due to a recent proliferation of Wal-Mart-type ‘big box’ stores that would be practically impossible in Europe because of stricter zoning plans. Since this ‘Wal-Mart effect’ is likely to taper off sooner or later, it is more accurate to say that ‘Baumol’s Disease’ has been protracted than to say that it has been cured.

Key words: Productivity, services sector, Baumol’s Disease, statistical artifacts

JEL classifications: C82, L80, L81, O41, O47, O57

## 1 Introduction

According to official statistics, labor productivity growth in the United States has uncoupled from its European counterpart since the mid-nineties. Table 1 shows that

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the U.S. labor productivity growth premium over the countries forming the European Monetary Union amounts to 1.3 percent per year. While the productivity growth rate has doubled in the U.S. after 1995 compared to the average of the previous two decades, productivity growth in Europe is on the decline.

**Table 1: Labor productivity growth in the United States and in the European Monetary Union**

	1995-2005		
	U.S.	Euro area	Difference
Labor productivity growth rate, overall economy (geom. mean)	2.2% p.a.	0.9% p.a.	1.3 PP

*Source: OECD Economic Outlook Database (accessed in September 2006)*

Many economists have been looking for the reasons behind this divergent development. Since the works of OLINER/SICHEL (2000), JORGENSON (2001), STIROH (2002) and others, economists have attributed most of the acceleration in productivity growth in the U.S. to the surge in investment in information and communication technologies (ICT) that started around 1995. Although ICT-investment accelerated also in Europe over the last decade, a couple of studies typically found that Europe's lagging behind is mainly due to lower *levels* of ICT investment (cf. COLLECCHIA/SCHREYER 2002, VAN ARK ET AL. 2002, VIJSELAAR/ALBERS 2002). MCGUCKIN/VAN ARK (2001) argue that a more successful implementation of ICT in Europe is hampered by the over-regulation of European labor and product markets that manifests itself for example in limits on shopping hours or restrictive hiring and firing rules. BESCH/ZIMMERMANN (2006) likewise call for the modification of dismissal protection laws in order to raise productivity growth in Europe.

My own approach in previous work (HARTWIG/SCHIPS 2005, HARTWIG 2006a, 2006b) has been to scrutinize measurement issues. As a response to the Boskin report (BOSKIN ET AL. 1996), which stated that the rate of consumer price inflation in the U.S. was upward-biased by 1.1 percentage points (PP) per year, statistical offices in the United States have introduced reforms to deflation methods that have contributed to lowering inflation. Of course, lower price increases translate into higher 'real' productivity growth (cf. ELDRIGE 1999). HARTWIG (2006) estimates that statistical revisions since the mid-nineties have pulled U.S. GDP – and hence *ceteris paribus* also productivity –

growth upwards by 0.5–0.6 PP per year. This is not to say that the increase in labor productivity in the U.S. since the mid-nineties is a statistical illusion. The Bureau of Economic Analysis (BEA), which is in charge with preparing the National Accounts, calculates most – but not all – revisions to the National Income and Product Accounts (NIPAs) backwards to 1959 (or even to 1929) so that new methods do not bias the time series. However, the apparently growing gap in productivity growth between the U.S. and most European countries is partly a statistical illusion since European countries have not – or only recently and without calculating their time series far backward – introduced comparable revisions. For example, the use of so-called hedonic deflation methods which HARTWIG (2006) identifies as being responsible for around half of the statistically induced upswing in U.S. productivity growth after 1995 is quite uncommon in Europe (cf. AHNERT/KENNY 2004). Section 4 below elaborates on hedonic deflation.

But hedonics cannot be the whole story, since, as VAN ARK ET AL. (2003) point out, most of the differences in transatlantic productivity growth stem from services. Except for housing rents,<sup>1</sup> expenditures on services are *not* deflated using hedonic techniques. VAN ARK ET AL. (2003) single out wholesale and retail trade and the financial services industry for being responsible for the bulk of the difference in aggregate productivity growth between the EU and the U.S. In these two industries, productivity growth in the U.S. was very high since the mid-nineties while it was only modest in Europe. Jack Triplett and Barry Bosworth, being less interested in transatlantic comparisons than in the sources of U.S. productivity growth, point at a third services industry with strong productivity growth – communications services (cf. TRIPLETT/BOSWORTH 2004: 17).

Triplett & Bosworth's research raises an interesting issue. Previous comparative studies have found productivity growth in manufacturing to be higher than in the aggregate of service industries (cf., e.g., SCARPETTA ET AL. 2000, WÖLFL 2003, WÖLFL 2005, ECB 2006), thus lending support to BAUMOL's (1967) model of 'unbalanced growth', according to which imbalances in productivity growth between a 'progressive' and a 'nonprogressive' sector of the economy lead to constant expenditure shifts into the latter – a phenomenon known as 'Baumol's Cost Disease'. Now TRIPLETT/BOSWORTH (2003, 2004) have raised doubts whether this 'stylized fact' is valid any longer for the

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<sup>1</sup> BLS uses the hedonic method since 1988 already to eliminate a 'downward bias' from the Consumer Price Index (CPI) component for housing services. This bias stems from the fact that the creeping deterioration of housing services quality does not lead to lower housing rents. Quality-adjusted rents rise, which had not been reflected in the CPI before 1988 (cf. HARTWIG/SCHIPS 2005).

U.S. Taking output data from BEA's industry output and input program and measuring labor input with BEA's series on persons engaged in production (full-time equivalents), Triplett & Bosworth compute productivity growth rates of 1.8 percent per year (p.a.) for the 'goods-producing industries' and of 2.3 percent p.a. for the 'service-producing industries' on average over the period 1995-2001 (cf. TRIPLETT/BOSWORTH 2004: 348, 350).<sup>2</sup> Consequently, they claim that 'Baumol's Disease has been cured'.<sup>3</sup>

The point this paper makes is that Triplett & Bosworth may have been too rash to dismiss 'Baumol's Disease'. The stress will not be on the fact that their results are at odds with productivity data coming from the Bureau of Labor Statistics (BLS), which relies on other statistical sources for input and output measures than the BEA. TRIPLETT/BOSWORTH (2003: 28) rightly argue that theirs is the only source providing comprehensive coverage.<sup>4</sup> Rather, I will argue (in the next section) that there are differences between Triplett & Bosworth's 'service-producing industries' and Baumol's 'nonprogressive' sector. Sections 3 to 5 go on to scrutinize the three industries mainly responsible for the productivity upswing in the U.S. It is argued that the high productivity growth rate in the finance and insurance sector found by Triplett & Bosworth is only due to an infelicitous choice of the sampling period. In wholesale and retail trade, there is a problem raised by Triplett & Bosworth themselves, which concerns the possibility that the productivity growth rate might be biased upward because hedonic deflators are used to calculate the 'real' trade margin. Section 4 proposes a method to quantify this bias. Section 5 argues that in the communications industry – as well as in a couple of further industries such as housing – the services are not delivered by human labor, but by capital goods alone. Therefore, it is not reasonable to calculate labor productivity (growth) for these industries.

Finally, there have been methodological changes in the calculation of value added in a couple of service industries, most notably in banking and health care. Sections 3 and 6 try to quantify the effects these changes had for overall GDP growth. Most foreign countries have not introduced comparable methodological changes, which should be kept in mind when comparing U.S. GDP growth with that of other countries.

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<sup>2</sup> RINCON/VECCHI (2003: 176) reach the same qualitative conclusion that productivity growth in the U.S. service-producing industries has been higher than in the goods-producing industries over the period 1995-2001. They use a company accounts database, though.

<sup>3</sup>

## **2 Baumol's 'nonprogressive' sector vs. the 'service-producing industries'**

In a seminal paper, BAUMOL (1967) argues that productivity growth is 'unbalanced' over different sectors of the economy. In a nutshell, his model states that because of a divergent productivity growth between what he calls the 'progressive' and the 'nonprogressive' sectors of the economy, expenditure shares shift towards the services sector. This shift of expenditures into activities largely financed out of tax money, such as education and health care, has been termed 'Baumol's Cost Disease' (cf. BAUMOL/TOWSE 1997). Baumol assumes that productivity growth is the result of technological innovation which manifests itself in new capital goods. It follows that productivity growth is largely confined to the manufacturing industries since, in most service industries, physical capital cannot be employed on a large scale. Baumol does not deny, that there can be increases in productivity in the 'nonprogressive' sector also, but he claims that "by their very nature, [these activities] permit only sporadic increases in productivity" (BAUMOL 1967: 416). In a joint paper with Sue Anne Batey Blackman and Edward N. Wolff, Baumol extends his model to capture what the authors call 'asymptotically stagnant activities'. These contain both a high-tech and a labor-intensive component such as, for instance, in television broadcasting or in computer services. These services can realize high productivity growth for some time as long as total costs are dominated by the technological component. However, as time passes, "the progressive component is innovating itself out of its cost-dominating position, ultimately the activity assumes all the characteristics of the stagnant services" (BAUMOL ET AL. 1985: 816).

As was mentioned in the introduction, TRIPLETT/BOSWORTH (2003, 2004) have recently asserted that 'Baumol's Disease has been cured' in the U.S. because they found average labor productivity growth over the period 1995–2001 to be higher in the 'service-producing industries' (+2.3 percent p.a.) than in the 'goods-producing industries' (+1.8 percent p.a.) according to BEA data. But their assertion can be disputed on several grounds. First, we should not forget that Baumol's distinction was between a 'progressive' and a 'nonprogressive' sector and not between 'goods-producing' and 'service-producing' industries. Of course, service industries belong to the 'nonprogressive'

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<sup>4</sup> Cf. <http://www.bls.gov/lpc/home.htm>. GORDON (2001) shows that data from different sources produce inconsistent results with respect to productivity growth in manufacturing and services.



sector, but so do agriculture, mining and construction which Triplett & Bosworth count as 'goods-producing'. With productivity growth rates of 1.0, 1.3 and -1.0 percent p.a., respectively, over the period 1995-2001 – according to TRIPLETT/BOSWORTH (2004: 348) – these three sectors pull the aggregate productivity growth rate of the 'goods-producing' industries downwards. As has been pointed out above, Baumol's 'progressive' sector essentially consists of the manufacturing industries. Even according to Triplett & Bosworth's calculations, average annual productivity growth in manufacturing is higher than in their 'service-producing industries' (3.2 vs. 2.3 percent). If we added agriculture, mining and construction to services in order to establish Baumol's 'nonprogressive' sector, it would become even more obvious that 'Baumol's Disease' is far from having been cured. As long as the productivity growth rate is higher in manufacturing than in the 'nonprogressive' sector, the shift of expenditure shares towards the latter continues.

Nevertheless, one could argue that 2.3 percent productivity growth per year in the services sector is certainly too high to be called 'sporadic'. Hence, Baumol's fundamental assumption that regular productivity growth only takes place in the 'progressive' sector seems to be invalid – at least for the United States. A closer inspection of the productivity growth rates of the twenty-nine service sector industries distinguished by Triplett & Bosworth – approximately at the two-digit level of the old U.S. Standard Industrial Classification (SIC) system that has been discontinued in the meantime and replaced by the North American Industry Classification System (NAICS) – reveals however, that the productivity growth in services is backed by only a handful of industries. These are, in the main, finance and insurance, wholesale and retail trade, and communications services (cf. also TRIPLETT/BOSWORTH 2004: 17). These will be inspected closer in turn.

### **3 Productivity growth in Finance and Insurance**

Annual productivity growth in finance and insurance has exceeded three percent on average over the period 1995-2001 according to TRIPLETT/BOSWORTH (2004: 350). The output per worker of security and commodity brokers has grown particularly strong in the range of 10 percent.

As has been mentioned above, the acceleration in productivity growth has mostly been attributed to the surge in investment in information and communication technologies (ICT) which took place during the period Triplett & Bosworth are focusing on. Surely, the finance and insurance industries (as well as wholesale and retail trade,

another sector with strong productivity growth) are heavy users of ICT. Yet, not only ICT investment surged from 1995-2001, but also the stock market during an era that we now – with the benefit of hindsight – call the ‘new economy bubble’. Output of the finance industries consists of earnings made in financial markets and usually rises ‘with the market’. So the high productivity growth rate found by TRIPLETT/BOSWORTH (2004) for the finance and insurance industries might be due to the fact that their period of investigation does not include the burst of the ‘new economy bubble’ after 2001.

As was mentioned above, the SIC dataset Triplett & Bosworth’s analysis is based on has been discontinued. The new NAICS series go back to 1998. We can check how, in the new data published by the BEA,<sup>5</sup> productivity growth rates in finance and insurance change when averaged over different periods.

**Table 2: Average labor productivity growth in Finance and Insurance based on gross output and persons engaged in production (geometric mean)**

	Labor productivity in Finance & Insurance
1998-2001	6.4 % p.a.
1998-2002	3.9% p.a.
1998-2003	3.6% p.a.
1998-2004	3.5% p.a.

*Source: Own calculations based on BEA GDP-by-Industry data*

As Table 2 shows, it matters for productivity growth in Finance & Insurance whether the years after 2001 are considered. Inclusion of 2002 leads to a drop in the average productivity growth rate by 2.5 percentage points (PP). One might argue that growth rates between 3.5 and 3.9 percent are still impressive and lie in the range of the Triplett/Bosworth estimates. Yet, all the productivity growth in Finance & Insurance took place between 1998 and 2000 during the financial markets bubble. Over the years 2001-2004, the average productivity growth rate has been negative in Finance & Insurance while the overall economy registered a positive productivity growth of 2.6 percent per year, according to BEA data. Overall, there is little evidence that ‘Baumol’s Disease has been cured’ in the finance and insurance industries.

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<sup>5</sup> Cf. [http://www.bea.gov/bea/dn2/gdpbyind\\_data.htm](http://www.bea.gov/bea/dn2/gdpbyind_data.htm).

In addition to the periodicity issue, there have been measurement revisions in the financial industries that have raised the productivity growth rate there. Until the year 2000, real output for both banking and nondepository institutions were extrapolated by labor input measures, as is done for most public services for which there are no market prices.<sup>6</sup> If output grows in line with labor input by construction, then, of course, there cannot be any growth in labor productivity.

In the 2000 revision of the industry database, apart from a couple of further minor changes, BEA switched the extrapolator for banking output. The new extrapolator is output-based; it takes account of the number of checks cleared, ATM transactions etc. (cf. TRIPLETT/BOSWORTH 2004: 107-8). The growth rates of the financial sector's value added were raised by this revision (cf. Table 3).

**Table 3: Finance Sector Value added growth before and after the 2000 revision to the BEA industry database**

	1992-97		
	Old	New	Difference
Depository institutions	-0.8% p.a.	1.0% p.a.	1.8 PP
Nondispository institutions	6.8% p.a.	12.8% p.a.	6.0 PP
Security & commodity brokers	19.5% p.a.	20.3% p.a.	0.8 PP

*Source: TRIPLETT/BOSWORTH (2004: 109)*

The methodological changes were extended back in time, so that they do not introduce a break into the U.S. series. "On the other hand, the positive output and productivity growth in banking would not have been apparent without the change in output measurement methodology" (TRIPLETT/BOSWORTH 2004: 108). It follows that the increased labor productivity in banking since the mid-nineties is *not* a statistical artifact – as it

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<sup>6</sup> EU legislation requires member states to start measuring volume changes of government output directly from 2006 on – at least for health and education services. Given that the requirements are sometimes vague, Member States are likely to implement them in different ways. This will introduce comparability problems both within the EU and particularly with the U.S. where the BEA continues to use input-based methods. Although one should expect that the adoption of the new methodology will raise productivity growth in the public sector, results from comparing input- and output-based measures for countries that dispose already of output-based measures have produced no clear evidence which method leads to a higher rate of labor productivity (cf. ECB 2006: 51-2 as well as the ATKINSON REVIEW 2005).

would have been if the revisions had not been carried back. However, international comparisons of value added and productivity growth might be biased by the introduction of improved measures in the U.S. For commercial banks and savings institutions (new ISIC<sup>7</sup> Revision 3 code 6519), for instance, only nine OECD countries apart from the U.S. calculate a Producer Price Index (PPI). The others still use input-based methods for extrapolating real output. For brokerage (ISIC Rev. 3 code 671), only three other countries have a PPI (cf. VARJONEN 2005, Table 2). It might be interesting to know by how much the switch to an output-based deflator has increased real U.S. GDP growth in order to have an estimate for the magnitude of the bias in international comparisons stemming from different methods to deflate nominal banking output.

The contribution to overall growth an industry makes is usually calculated by multiplying its real growth rate by the share of the respective industry in (nominal) GDP in two adjacent years. From Table 3 we know the old and new real growth rates for the three banking industries that were distinguished by the old SIC. Nominal value added for 1992-97 can be gathered from LUM/MOYER (1998, Table 10). (To retain consistency, I use nominal GDP data from the same source even though GDP has been revised several times since then.) Table 4 gives the results. It summarizes the estimates of the quantitative impact of U.S. reforms to deflation methods in services on real GDP growth along with the sources of these estimates and a 'period' – which is the period of time over which annual growth rates have been averaged in the sources. As can be seen from the table, the periods are not the same. But that doesn't matter as long as we assume that the effect within the respective periods can be extrapolated. In other words, I assume that, were the reforms revoked, the respective growth rates would fall back to their status quo ante.

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<sup>7</sup> ISIC = International Standard of Industrial Classification.

**Table 4: Contributions of changed deflation methods in services to real U.S. GDP growth**

	Period	Sources	Contribution to growth (PP per year)
<b>Output-based extrapolation of real banking output</b> of which - Depository institutions - Nondepository institutions - Security & commodity brokers	1992-97	LUM/MOYER (1998, Tab. 10) TRIPLETT/BOSWORTH (2004, Tab. 5-6)	<b>0.10</b>  of which 0.06 0.04 0.01
<b>‘Inside-the-box effect’</b> (decrease of the retail trade deflator due to hedonic deflation of goods sold)	1994-2004	TRIPLETT/BOSWORTH (2004, Tab. 8-1), TIMMER ET AL. (2005, Tab. 2)	<b>0.02</b>
<b>New deflators for medical care</b>	1998-2004	TRIPLETT/BOSWORTH (2004, Tab. A-3)	<b>0.04</b>

#### 4 Productivity growth in wholesale and retail trade

Wholesale and retail trade have also witnessed strong productivity growth in the range of 3 to 4 percent per year according to TRIPLETT/BOSWORTH (2003, 2004). Yet, these authors have also identified a potential source of measurement error in retail trade. TIMMER ET AL. (2005) have coined the term ‘inside-the-box effect’ to circumscribe the problem, which concerns price measurement and the use of hedonic techniques. The hedonic method constitutes one of several possibilities to cope with the fact that goods and services whose price development one wishes to measure may change in quality. The basic idea is to estimate the money value of certain product *characteristics* by performing statistical regression analysis on cross-section or pooled data. The hedonic method seems to lend itself especially well to computer hardware. On the one hand, hardware quality (computing speed) improves quickly, whereas the price for a desktop computer remains rather stable. This means that there is a large difference between a quality-adjusted and a non-quality-adjusted price index for computers. On the other hand, all relevant product characteristics, like computing speed or memory size, can be easily quantified (which is necessary for the regression analysis). The estimated coefficients are used to deduce the estimated money value of quality improvements from observed price increases. If prices, e.g., for desktop computers remain stable, then the quality-adjusted price index will show a decline in desktop prices.

In the meantime, BLS uses the hedonic method not only for calculating quality-adjusted prices for desktop computers, but also for TV sets, DVD players, VCRs, camcorders, audio systems, micro wave ovens, refrigerators, freezers, washing machines, tumble-dryers, college textbooks, non-residential structures, photocopying equipment and possibly other goods – their number increases continuously. Already some time ago, MOULTON (2001) noted that 18 percent of all expenditures that make up nominal U.S. GDP were deflated using price indexes that use hedonic methods.

Obviously, the hedonic method lends itself mainly to goods. As was already mentioned, with the exception of housing rents, expenditures on services are not deflated using hedonic techniques. Some believe that this is precisely the problem that gives rise to the specter of ‘Baumol’s Disease’: If service prices were calculated correctly – taking quality improvements into account – then ‘real’ value added and labor productivity would be higher in services – possibly as high as in manufacturing. Section 6 below will elaborate on this view for the case of medical care prices.

Hedonic deflation presents a problem for the correct measurement of the value added in wholesale and retail trade. Value added in each sector consists of the value that it literally ‘adds’ to purchased ‘intermediate inputs’. In wholesale and retail trade, value added is defined as the trade margin. To arrive at the ‘real’ value added, the trade margin has to be deflated. In the U.S., a sales price index is used to deflate the trade margin while in Europe it is normally assumed that the real value added of the trade sectors grows in proportion with the volume of sales. BEA’s use of a sales price index that is adjusted for quality change as deflator in fact implies that the sale of higher quality goods requires more effort on the part of the trade industries than the sale of goods of lower quality.

While this might be a defensible proposition in some cases, TRIPLETT/BOSWORTH (2004: 240) remain skeptical with respect to computers. Electronic stores sell boxes filled with computers. The salesperson’s effort is hardly associated with the technical characteristics of the machine inside the box. Even so, electronic stores have witnessed the strongest productivity growth of all outlet categories in the U.S. between 1987 and 2001, according to official statistics (cf. TRIPLETT/BOSWORTH 2004, Table 8–1). Again, the transatlantic comparability of ‘real’ growth rates is impaired since European countries use different deflation methods. AHMAD ET AL. (2003: 25) show that the U.S. trade deflator has not risen at all between 1993 and 2001 while, over the same period, the German deflator has risen by 30 percent, and the Italian by 20 percent. Concomitantly, ‘real’

value added per employed person in the wholesale and retail industry has increased by 40 percent in the U.S., but only by 10 percent in Italy, and not at all in Germany.

To the best of my knowledge, no attempt has been made so far to quantify the impact of the ‘inside-the-box effect’ on U.S. GDP growth. I will give it a try. TIMMER ET AL. (2005) argue that the ‘inside-the-box effect’ could be eliminated if, instead of deflating the trade margin with a (hedonic) sales price index – which is the current practice –, goods sold and goods purchased were deflated separately with indices that use the same techniques for quality adjustment (so-called ‘double deflation’). Unfortunately, data availability is far from perfect, and Timmer et al. have to make several critical assumptions to calculate double-deflated margins. Stressing that their estimates are of an experimental nature, they come up with an estimated real margin growth rate in electronics and appliance stores – the vendors of computers and other electric appliances that are subject to hedonic deflation – of 10.7 percent per year over the period 1993-2002. This contrast with 18.8 percent per year over the period 1995-2001 if calculated traditionally (cf. TRIPLETT/BOSWORTH 2004: 236).

The contribution to overall growth of electronics and appliance stores will differ depending on whether the average real growth rate of this industry is 18.8 or rather 10.7 percent. Again, I compute the difference of the contributions to growth taking the two estimates of Triplett & Bosworth and Timmer et al. for granted. The difference between the two contributions to growth is the ‘contribution’ of the ‘inside-the-box effect’ and should probably be deducted from the official U.S. real GDP growth rate. Taking nominal GDP data from the BEA homepage<sup>8</sup> and data on gross margins of electronics and appliance stores from the Bureau of Census’ *Annual Benchmark Report for Retail Trade and Food Services 2006*,<sup>9</sup> I calculate a growth contribution of the ‘inside-the-box effect’ of 0.02 PP (cf. also Table 4). This is a very low value. Although computers etc. are probably sold in other kinds of stores also, e.g., ‘general merchandise stores’, I conclude that the observed strong growth of output and productivity in wholesale and retail trade,<sup>10</sup> which has been attributed mainly to the proliferation of ‘big box’ Wal-Mart stores over the last decade (cf. SIELING ET AL. 2001, FOSTER ET AL. 2002), is ‘for real’.

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<sup>8</sup> Cf. <http://www.bea.gov/bea/dn/gdplev.xls>, accessed August 25, 2006.

<sup>9</sup> Cf. [www.census.gov/prod/www/abs/br\\_month.htm](http://www.census.gov/prod/www/abs/br_month.htm).

<sup>10</sup> Real gross output has grown by 3.8 percent per year in wholesale trade over the period 1998-2004 and by 5.2 percent in retail trade. Productivity growth has been 4.3 and 3.9 percent per year, respectively, according to BEA data.

So has ‘Baumol’s Disease’ been cured in the retail industries? “For Americans”, ROGOFF (2006) writes, “there is the additional question of what to do when the big-box store phenomenon has run its course. If so much of the US productivity edge really amounts to letting Wal-Mart and its big-box cousins run amok, what will happen after this source of growth tapers off?”. So it seems that the Wal-Mart phenomenon has not cured ‘Baumol’s Disease’ in wholesale and retail trade – it has only protracted it.

## **5 Productivity growth in communications services**

Labor productivity in communication services has grown by around 7 percent per year both according to TRIPLETT/BOSWORTH (2004: 350) and the new BEA ‘GDP-by-industry’ data. Fair enough. – But I wonder: Precisely who is rendering me a service when I pick up the phone to call somebody? I mean, given that the days of the switchboard girls are over. Of course, it is the telephone network rather than human labor that renders me a service. The network consists of capital goods that were installed by construction workers who are no part of the communications services industry. My point is, since no human labor is involved in the production of the communications service proper, what sense does it make to calculate a labor productivity growth rate for communications services.

So what about the (according to the 2002 Economic Census<sup>11</sup>) 1.4 million employees of the telecommunications industry (NAICS Code 517)? Aren’t they delivering telecommunications services? – To tell the truth, I don’t think so. The employees of the telecommunications industry are occupied with tasks like billing, customer care, management, repair & maintenance etc. – tasks that do not directly enable other people to communicate. The telecommunications services proper are produced by the network capital alone. Human labor enables the capital goods to unleash their productive powers. Without billing and customer care, the network capital would remain barren. The best way to look at things is to say that while producing the communications services, the network capital buys intermediate inputs from humans – inputs that are necessary to market the services. So the people employed in NAICS Code 517 should better be reallocated to the ‘Professional and Business Services’ (NAICS Code 54). Here, their labor productivity would certainly not exceed that of their colleagues. NAICS Code 517 should be understood to be devoid of employment; hence the term ‘labor productivity’ should be abandoned for telecommunication services. Such a move would not

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<sup>11</sup> Cf. [http://www.census.gov/econ/census02/data/us/US000\\_51.HTM#N517](http://www.census.gov/econ/census02/data/us/US000_51.HTM#N517)



alter the gross output of this industry, only its value added would be reduced as it was assumed that the value of purchased intermediate inputs would rise. Of course, the argument carries over to other network industries such as ‘Utilities’ (NAICS Code 22) and ‘Pipeline Transportation’ (NAICS Code 486).

There is another industry that needs no labor input for its core activity so that it makes no sense to calculate labor productivity (growth) for it, namely housing. The Bureau of Labor Statistics acknowledges this for the production of owner-occupied housing and the rental value of buildings and equipment owned and used by nonprofit institutions serving individuals. When calculating aggregate productivity growth for the U.S. business sector, BLS excludes these components “because no adequate corresponding labor input measures can be developed” (ELDRIDGE 1999: 36). In the old SIC tables, the BEA published no labor input measures for the whole production of housing services (including tenancy).<sup>12</sup> Indeed, it is difficult to see what kind of service my landlord – as opposed to the housing capital good that belongs to him – renders me.

FISHER (1935) and CLARK (1940) independently of each other developed the ‘three-sector hypothesis’ according to which economic progress will turn agrarian societies into industrial societies before the latter transform themselves into service economies. FOURASTIÉ (1949) is well known for sharing this view.

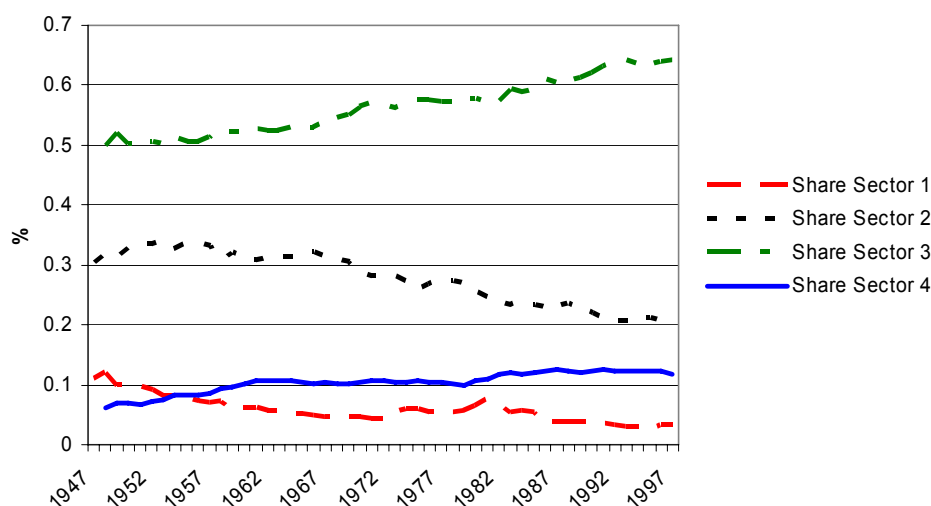
But perhaps there are not only three sectors in the economy, but four. It is not appropriate to count output that is produced without labor input as part of the manufacturing sector (*manus* = hand) or as part of the services sector since services, at least from Fourastié’s point of view – and let’s also not forget Baumol –, are understood to be *human* services. So I propose to establish a fourth sector of the economy and to allocate the activities enumerated above to it. It is then interesting to check whether the famous Tertiarization has not in fact been a ‘Quartiarization’, that is, a shift of production to industries that need no labor input.

To do so I use the old SIC data since I’m interested in long-term developments, and the SIC data cover the period 1947 to 1997 (albeit with a break in 1987 in some industry series). My fourth sector consists of the following industries: ‘Pipelines, except natural gas’ (SIC Major Group 46), ‘Telephone and telegraph’ (SIC Codes 4811, 4812 and 4822), ‘Electric, gas, and sanitary services’ (SIC Major Group 49), and ‘Housing’ (SIC Codes 6512-6519). I will calculate the share of this sector in the total economy in the following manner. I assume that these industries are in fact devoid of employment. The employ-

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<sup>12</sup> Cf. [http://www.bea.gov/bea/dn2/gdpbyind\\_data.htm](http://www.bea.gov/bea/dn2/gdpbyind_data.htm).

ees attached to some of them in the BEA statistic are assumed to deliver in fact business services. I further assume that these employees have the same average (nominal) productivity as their colleagues in the SIC Major Group 73 ('Business services'). This gives the value of intermediate services that 'Sector 4' buys from the enlarged 'Business services' industry. I deduce these values from the value added of the respective industries as given in the BEA statistic to obtain the 'true' value added of 'Sector 4'.



**Figure 1:** Sectoral shares in U.S. GDP

Figure 1 shows that Tertiarization in fact takes place – but so does 'Quartiarization'. While the share of value added of the – redefined – tertiary sector in U.S. GDP has risen from 50 to 64 percent between 1948 and 1997,<sup>13</sup> the share of the 'fourth sector' – which produces without labor input – has risen from 6 to 12 percent. Sector 4 contains the most productive 'services' such as telecommunications and the production and distribution of energy. If we recognize that these activities are no services of labor so that the calculation of labor productivity (growth) does not make sense here, aggregate productivity growth in the services sector drops to the ground. Overall, very little evidence remains that 'Baumol's Disease has been cured'.

<sup>13</sup> As there are no data for persons engaged in production for 1947 in the 'GDP-by-industry' database, we lose this year for our calculation of the value added of Sector 4. Since the value added of Sector 3 is calculated as the difference between GDP and the sum of value added of Sectors 1 (Agriculture, forestry, fishing and Mining), 2 (Construction and Manufacturing) and 4, the series for Sector 3 also starts in 1948.

## 6 New deflators for medical care

Health services, together with education, serve as prime example for an industry beset by the 'Cost Disease' in BAUMOL (1967). Labor intensity is high here, and medical appliances are normally not installed in order to substitute labor or to raise its productivity, but in order to equip the staff with new instruments.<sup>14</sup> TRIPLETT/BOSWORTH (2004: 350) confirm that the productivity growth rate is relatively low in health services. They calculate a rate of 0.9 percent per year over the period 1995-2001.

Yet, already the Boskin Commission (BOSKIN ET AL. 1996) suspected the medical care price index in the U.S. to be upward-biased substantially due to a failure to account for quality improvements in treatments, e.g., the reduction of pain thanks to minimum invasive surgery. As was mentioned above, there is a strong tendency to quality-adjust price indices in the U.S. (which stands in stark contrast to the practice of most European countries). On the other hand, it has also been mentioned that quality-adjustment using hedonic methods is confined to certain goods so far. Except for housing rents, services prices are not quality-adjusted using hedonic methods. In line with earlier studies (e.g., TRIPLETT 1999, BERNDT ET AL. 2000), NEWHOUSE (2001: 52) suggests "a large constant upward bias" in medical prices, although without being able to present precise estimates. Each upward bias in a price index translates into a downward bias in the index of real value added that is calculated by deflating nominal expenditure with that price index. So, probably, productivity growth in health care only *appears* to be lower than in manufacturing due to mis-measurement of price changes. If so, Baumol's theory would be invalidated.

Although it did not switch to hedonic deflators, BLS introduced new indices for hospitals services in its producer price index in 1997. Instead of reflecting the costs of a day in hospital (as before), the new indices track the costs for treating certain conditions (cf. CATRON/MURPHY 1996). The new indices present a picture of lower medical care price inflation than the old components of the Consumer Price Index. BLS subsequently introduced a similar method into the CPI. Also, the BEA uses the new PPI hospital care indices as deflators. The rate of labor productivity growth, which had been negative before (−0.5 percentage points per year over the period 1987-1995) turned positive (+0.9 PP p.a. over the period 1995-2001). "A portion of that acceleration is caused by changing

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<sup>14</sup> Baumol affirms this with respect to computers. He writes: "Despite the use of the computer in medicine ..., there is no substitute for the personal attention of a physician ..." (BAUMOL, 1967: 423).

the price deflator” (TRIPLETT/BOSWORTH 2004: 262), which has apparently not been ‘back-cast’.

To estimate the (maximum) impact of the reform to medical care deflators on GDP growth I assume that the entire difference between the old and new productivity growth rates in health services (of 1.34 PP according to TRIPLETT/BOSWORTH 2004: 350) is due to statistical reasons. The productivity growth rate in ‘Health care and social assistance’ has been 1.41 percent on average over the period 1998-2004, according to BEA’s ‘GDP-by-industry’ data. Assuming a growth rate that is 1.34 PP lower, we can calculate a simulated chained real gross output series that can be transformed into a simulated nominal gross output series using the chain-type price index for gross output of health services and social assistance. Deducting the original data for health services output from overall gross output and adding the simulated data gives a simulated nominal gross output series that can be transformed into a ‘real’ series using the chain-type price index for overall gross output. From the growth rates of both this series and the overall intermediate inputs from the ‘GDP-by-industry’ database simulated GDP growth rates can be calculated – of course observing the chaining rules. These can be used to simulate data for the level of real GDP (at prices of the reference year 2000). This series grows by 2.54 percent per year on average over the period 1999-2004, which is 0.04 PP less than official GDP (see Table 4). So the reform to medical care deflators has introduced only a minor bias into U.S. GDP growth.

Of course, skeptics of Baumol’s theory could argue that medical price indices are still upward biased since, for instance, nothing has been done to remove the quality change bias mentioned above. Obviously, it is very difficult, if not impossible for statistical offices to measure certain quality changes in the provision of (health) services that come along with new technologies and procedures. TRIPLETT/BOSWORTH (2004: 266) note:

*“Calculating the change in costs for treating an episode of illness requires not only the traditional statistical skills in gathering prices, but also a great deal of medical knowledge about changes in the efficacy of medical treatments – knowledge that in many cases is scientifically uncertain or whose validity is contended. It also requires knowledge about patient valuations of changes in treatments – particularly when changes involve the patient’s time and tolerance for pain – and valuation of the disutility of side effects or of the onerous implications of frequent treatments.”*

Since statistical offices probably never will be able to gather such a vast amount of information, the hope to cure ‘Baumol’s Disease’ by constructing unbiased medical care

price deflators seems to be illusory. Furthermore, it is far from being uncontroversial that a comprehensive quality-adjustment of health care prices is desirable. Many believe that quality improvements that are not paid for should be ruled out of National Accounts with their traditional focus on market transactions for measuring GDP (cf. TRIPLETT/BOSWORTH 2004: 265). According to Baumol, for instance, “productivity measurement must deliberately avoid any attempt for correction for improvement in quality” (BAUMOL 1993: 28).

## Conclusion

This paper starts from the observation that labor productivity growth accelerated in the U.S. after 1995 while it slowed down in continental Europe at the same time. VAN ARK ET AL. (2003) single out two service industries that are responsible for most of the difference in transatlantic productivity growth, namely the financial sector and wholesale and retail trade. The observation that several important service industries have shown strong productivity growth over the last years has led TRIPLETT/BOSWORTH (2003) to assert that ‘Baumol’s Disease has been cured’ – at least in the U.S. This paper challenges their view.

The main arguments put forward here are, first, that Baumol’s ‘nonprogressive’ sector is larger than Triplett & Bosworth’s services sector. After an appropriate rearrangement, Triplett & Bosworth’s data fail to support their claim. Second, productivity growth in the financial sector has been a short-lived ‘new economy bubble’ phenomenon. Over the years 2001-2004, the average productivity growth rate has been negative in Finance & Insurance. Thirdly, if we speak of ‘services’ we should confine ourselves to human labor. For several industries it would be very artificial to contend that human labor is involved in the production of the service proper. This holds for example for housing services, but also for communications services. I propose to collect these activities in a ‘fourth’ sector of the economy – complementing the familiar three. This sector would contain the most productive ‘services’, leaving productivity growth in the redefined tertiary sector at a very low level. Overall, there is little evidence that ‘Baumol’s Disease’ has been cured’.

Finally, there are measurement issues; but the share of the U.S. productivity growth premium over Europe that is caused by different statistical methods on both sides of the Atlantic, e.g. differing deflation methods, seems to be small in the service sector – probably around 0.15 percentage points per year. So what *are* the reasons behind the U.S. lead in productivity growth over Europe. With the financial sector having dropped

out in 2001, the only remaining explanation for this lead is that labor productivity in the U.S. retail industries grows faster than in Europe. “The notion that Americans have gotten better at everything while other rich countries have stood still is thus wildly misleading. The US productivity miracle and the emergence of Wal-Mart-style retailing are virtually synonymous” (ROGOFF 2006). If so, then, of course, there is not much Europe can do to catch up. With a population density that is much higher than in the U.S., European countries have enacted strict zoning plans in order to protect the remaining plots of virgin lands as well as the business life in the historic city centers. Both INKLAAR ET AL. (2005) and MCGUCKIN ET AL. (2005) seem to consider these zoning plans that inhibit the emergence of Wal-Mart-style ‘big box’ stores to be the single most important reason for the lower productivity growth in Europe compared to the U.S. Nevertheless, the policy proposal made by BAILY/KIRKEGAARD (2004: 8) to reform European land-use planning will probably not find favor with many Europeans.

*“While the American form of metropolitan organization may promote productivity growth, Europeans are rightly skeptical of unmeasured costs of low urban density in America as promoted by explicit government policies. Europeans decry side-effects of the American system that may promote productivity without creating consumer welfare, including excess energy use, and time spent in traffic congestion” (GORDON 2004: 1).*

Obviously, different preferences can result in different productivity growth rates. It is hoped that politicians – especially in Europe – understand the reasons why European productivity growth falls short of its U.S. counterpart before pushing through inappropriate policy reforms.

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