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The Theoretical, Conceptual and Empirical Impact of the Service Economy

A Critical Review

Birgitte Andersen[1] and Marva Corley[2]

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Abstract

This paper offers a critical review of the conventional economic classification, measurement and valuation of output, and related performance indicators, for the service sector. The paper also explores and contrasts long-standing views on the service knowledge base and service innovations, as well as the global aspects of many services. A problem arises when historical industrial classification schemes treat services as being 'immaterial' (i.e. everything that is not manufacturing and agriculture), while ignoring that the activities of services in the economy, as well as the corporate structures of firms, transcend such classification schemes at any level of aggregation. Other problems arise when associated traditional analytical methods measure services input and output and related performance indicators using the same conceptual framework and indicators as those that are applied for problem solving for agriculture and manufacturing. Such entanglements have other and wider consequences for understanding the impact of the *new economy* and for designing appropriate policy.

Keywords: services, classification schedules, output measurement, productivity, knowledge and innovation, global economy

JEL classification: L8, O3, O47

[1] Dept. University of London, e-mail: b.andersen@bbk.ac.uk ; [2] Employment Strategy Department, ILO

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UNU World Institute for Development Economics Research (UNU/WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

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1 Introduction

Much of the contemporary economic literature on the rise of the service economy unfortunately, but justifiably, takes the nature of an attack on the economic measurement of service statistics, which have developed around the methodology used for the manufacturing sector. In this context, our paper critically reviews the theoretical and empirical form, function and impact of the service sector in the economy.

There is already a vast amount of literature concerning the conceptualization and measurement of services in the output, employment, productivity and innovation literature, including numerous reviews on the need for improving and developing new indicators and datasets.[1] However, due to the increased rate and direction that such stimulating published material is taking, we now see a need for classifying and systematically addressing such problems.

The service sector accounts for over two-thirds of output in many of the industrialized countries, and has been steadily increasing over the years. However, our ability to identify and measure the constituency of service industries from the statistical standpoint is lagging behind the growth of this sector. The economic perception of what characterizes a service is muddied, and attempts to measure the inputs and outputs of the sector based on the conceptualization of the manufacturing sector is a flawed approach.

Understanding the role of services in the economy is not only about appropriate data for appropriate indicators, but it is also about appropriate methodology and conceptualization of what we plan to measure (or think that we measure). This undertaking requires a revised theoretical, conceptual and empirical understanding of the economy as a whole.

Additionally, the *new economy* as characterized by the Internet and e-commerce has altered many of the ways in which goods and services are produced, exchanged and consumed. The rapid changes in information technology have served to highlight the roles of services in our economy and expose the flaws that exist in the way national and international statistical agencies deal with them. Government statistical agencies have been revising methodologies to take into consideration some of this new phenomenon, but have been hard-pressed to solve many of the myriad problems that involve service measurement. For sure there is a lacuna between the economists who theorize the role of services, statisticians who develop the measures, and laymen who can properly conceptualize the rapid changes that are taking place in industries. Without a synthesis between these parties, measurement becomes rote procedure for statisticians based on outdated and often times flawed methodology.[2]

Why are services so important? As mentioned earlier, services represent an overwhelming chunk of output in most industrialized countries. Consequently any error in the measurement of output will show up in National Accounts in the form of official

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1 See for example Sherwood (1994); Griliches (1992, 1994); Bosworth and Triplett (2000, 2001), Kunze and Jablonski (1998), and Tomlinson (2000).

2 For example, it was not until 1999 that banking output was changed to take into consideration ATM machines (Triplett 1999).

measures of gross domestic product (GDP). GDP figures are used for the funding and allocation of government services and projections of future government revenue.

Additionally, productivity statistics are derived from output and input measures. Thus, any errors in output and input will feed into productivity measures, which may be one reason why productivity of the some of the service industries remains so low.

One of the most alarming facets about the *new economy* is that those industries that use new technology the most are determined as having the lowest levels of measured productivity. However, one of the arguments is not that these industries are unproductive, but that our attempts to measure such productivity with the data and definitions that we have available are flawed. Similar problems become visible when measuring the services knowledge base and service-innovation, as well as services' impact on global productive systems.

Drawing upon the classical philosophers inherited from the past, the paper starts out by explaining the role of services in current theoretical, conceptual and empirical research. The output and productivity function used in conventional economics and associated national statistics is then discussed in relation to the nature and characteristics of services. The paper then moves on to discuss the form and function of the services labour force and services knowledge bases, and how this compares with our conventional understandings of such. Finally, services' impact on global systems is discussed.

2 Services classifications

2.1 The heritages from the past

The *physiocrats* introduced a new revolutionary concept of *productive* and *unproductive* or *sterile* labour in which the agricultural sector was regarded as the only sector capable of producing a surplus over replacement costs and the only real source of wealth. The farmers therefore formed the *productive class*, as opposed to (i) the *sterile* unproductive manufacturing class (whose role was only regarded as manipulation and not creation of wealth) and the (ii) class of landlords, or distribution class (whose economic role was to consume the surplus created by the productive class and to begin, by the expenditure of the rents, the circulation process of money and goods among the economic sectors).[3]

Adam Smith, in his *Wealth of Nations* in 1776, and Karl Marx, in his *Das Kapital* in 1873, adopted the *physiocratic* concept of productive and unproductive labour (although Adam Smith rejected the view that manufacturing, trade and transportation were sterile occupations), and they did not give the service sector an explicit treatment as a distinct activity. In this framework the service sector was also implicitly viewed as being immaterial and unproductive, because it could not reproduce the economic system or create wealth to the nations by adding value to materials (as agriculture and manufacturing). Furthermore, they asserted that the value of services could not be recaptured by sale due to instantaneous consumption (i.e. service production process cannot be separated from consumption).

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3 See, for example, Quesnay's *Tableau Economique* from 1758, or for and overview, see Screpanti and Zamagni (1995: 44-8).

In the context of present time, the *physiocrats*', Adam Smith's and Karl Marx's notion of services is generally based upon what we today determine as *consumer services* or *personal services*, although financial and insurance services were increasingly important already at the time of Adam Smith during the rise of industrial activity and international trade and shipping.

The *physiocrats'*, Adam Smith's and Karl Marx's understanding of the role and impact of services in the production system have been pervasive regarding the way conventional economics and national accounts today theorize, conceptualize, and measure services' role in the economic system. It is quite plausible that such views (e.g. that services are 'manipulating wealth' and not value creators) may be one of the reasons for the lack of effort that has gone into the development of service measures based upon the characteristic elements of services; and why an exclusively manufacturing and agriculture approach to output and productivity problem-solving has been adapted. As discussed below, it is also the reason why the communistic East Bloc operated with a national material product account and disregarded the importance of services' role, in its own right, in the economic system.

2.2 A distinct activity

The first specific attempt to define services as a distinct activity was characterized by Fisher (1933, 1935, 1939) and Clark (1940). They sub-divided the economy into three categories: primary (agriculture, fishing), secondary (mining and manufacturing) and the residual tertiary (immaterial service) sector. The basis of Fisher and Clark's approach was to describe distinctive features of each of the three sectors (e.g. distribution of workforce, income-elasticity and structure of consumer demand, technological progress and economic development). This is basically still how the aggregate service sector is regarded today in mainstream economics and national accounts (i.e. as everything that is not agriculture or manufacturing).

Empirical studies in the economic literature and most statistical accounts in industrialized countries have broken what Fisher and Clark termed the tertiary or service sector into general structures. For example, the International Standard Industrial Classification (ISIC), which is used by OECD and EUROSTAT is categorized as follows:

- ISIC G Wholesale and retail trades
- ISIC H Hotels and restaurants
- ISIC I Transport, storage and communications
- ISIC J Financial intermediation
- ISIC K Real estate, renting and business services
- ISIC L Public administration and defence
- ISIC M Education
- ISIC N Health and social work
- ISIC O Community, social and personal services

Classification schemes differ by country and can change over time due to new frontier possibilities in services. These changes hamper a direct comparison of service activities across countries and time. Japan's Ministry of Finance in the early 1980s revised their service classifications due to the microprocessor revolution. This was especially in relation to taking in new tertiary industries associated with software, information, business services, culture and sport (Clairmonte and Cavanagh 1984). This is to be viewed in contrast to many East Bloc communist countries (with the Marxian heritage), which in the beginning and mid 1980s still did not consider the dynamics of the service sector and operated instead with a national material product account (as opposed to our notion of a gross national product). More recently, the United States changed its system from the Standard Industrial Classification System to the North American Industrial Classification System (in order to standardize its classification with Canada and Mexico) and in doing so introduced many new service industries that were previously unclassified.

Differences in opinion have arisen among academics in relation to (i) which industries to include as sectors, (ii) defining the boundaries between the three sectors in the Fisher-Clark model, and (iii) defining the boundaries between several of the sub-sectors (Clairmonte and Cavanagh 1984; Petit 1986). Petit (1986) explained how Clark regarded 'construction' as service activity, and how Simon Kuznets eliminated transportation, communications and public utilities in the 'services category' in his later work.[4] Stigler (1956) asserted that there exists no authoritative consensus on either the boundaries or classification of services.

Additionally, another problem of the classification systems in general is that enterprises are classified according to their 'primary product'. Thus, an enterprise that has an output that spans across several classification codes will only be grouped in one category. Consequently, academics that consider changing activities in relation to the 'users' of the services in question have classified the service products into somewhat broader schemes (Petit 1986; Walker 1985; Miles *et al.* 1995) as specified below:

- *Producer services or business services*: finance, insurance, real estate (FIRE) and other business services (e.g., research and development, advertising) for intermediate demand;
- *Consumer services or personal services*: for example, hotels and restaurants, miscellaneous repair and maintenance services, motion pictures, amusement, recreation, private households, personal care for final consumption;
- *Collective services*: for example, health, education, non-profit organizations;
- *Government*: public administration, military;
- *Distributive services*: for example, transport, communication, utilities, wholesale;
- *Retail*: shops.

The bottom line is that, one must question to what extent *any* service product boundaries are meaningful today. Most large multinational enterprises have corporate structures which transcend the primary, secondary and tertiary sectors of the Fisher-

4 To give an example of this, Petit (1986) compared Kuznets' work from 1955 with his work in 1958.

Clark model, not to mention the great extent to which they even transcend sub-sectors across as well as within services and manufacturing (Clairmonte and Cavanagh 1984).

Finally, a major problem is that all these types of classification schemes ignore the growing complexity of service activities in the economy as a whole. We argue that it is no longer satisfactory to treat services and non-services as independent creators of output, value, productivity, employment as well as knowledge and innovations. What seems to be relevant is their mutual interdependence in establishing activity and performance for both manufacturing and services (Miles *et al.* 1995; Andersen *et al.* 2000).

3 Services and the productivity mirage

As mentioned in the introduction, one of the most alarming facets about the new economy is that some of the industries that use new technology the most are determined as having the lowest levels of measured productivity. This section discusses how our attempts to measure such productivity with the data and definitions that we have available are flawed.

There are two notions of productivity most commonly used to gauge economic performance: labour productivity and total factor productivity (TFP). Labour productivity is measured as output per hour of labour employed, while TFP, the most comprehensive measure of productivity, is based on the formula:

TFP = Y/(K+L+E+M+S), where Y is output, L is labour, K is capital, E is energy, M is materials and S is services.

These measures are difficult in and of themselves to measure in manufacturing industries, but when doing so in the service industries it becomes that much more problematical. The following sections will discuss elements of these components and bring forth the issues in terms of conceptualization and measurement in the service industries.

3.1 Productivity and economic performance

In view of the fact that (i) productivity growth has become one of the key statistics in the debate defining the new economy (mainly because one of the defining traits of economic revolutions has been the ability of advances in technology to sustain high growth rates of productivity), and that (ii) the service economy (especially knowledge intensive business services) has increased in role and impact; services productivity has become a matter of attention.

Macro economists tend to be fascinated by productivity measures as this gives us an indication of the extent to which growth can occur without putting inflationary pressures on the economy. Productivity growth leads to increased standards of living by allowing firms to offset rises in wages through increases in output instead of increases in prices. Consequently, the costs of goods are kept down and inflation remains low (because of the stability of prices). Thus, the growth rate of productivity gives us an indication of the extent to which real wages can grow without putting inflationary pressures on the

economy. As long as productivity grows at a higher rate than real wages, firms will continue to make a profit. As the firms increase their profits there is more money available to invest in new resources such as computers, machinery, equipment and to hire more labour. This creates a virtuous circle of: increased production, increased investment and increased wages, which lead to a growing economy.

But, if productivity growth is faltering, then growth in real wages may grow at a higher rate than productivity; and firms' profits will be decreasing, which leaves less money available for new resources; investment in new equipment will decrease and employees will be made redundant. As employees are laid off and investment in new machinery and equipment is slowed, this creates a downward spiral in the economy of decreased production that leads to slow growth and eventually a recession. The bottom line is that productivity growth is the *key* to long-term economic growth.

As mentioned above, total factor productivity (TFP) is output (Y) relative to the factors used for production (K,L,E,M,S). Hence, it is a measure of the efficiency of the factors of production. TFP growth is commonly measured as a residual, using the growth accounting framework.[5] In this framework, we assume that any changes in output that cannot be attributed to the changes in the factors of production are the result of productivity growth:

↖TFP = ↖Y – (↖ K - ↖L - ↖E - ↖M - ↖S), where ↖ is denotes percentage (%) change.[6]

Thus, as long as output is growing faster than the resources of production, the firm (industry or economy) will continue to grow. Accordingly, an increase in productivity has occurred if with the same resources employed firms are able to produce a larger output, or if we sustain the same output with less resources employed.

Productivity can be measured at all levels, being the firm, the industry, or the nation. However, there are many problems related to measures of productivity in services as will be clear from the discussion which follows below.

3.2 Conceptualization of output (Y) measurements in services

Due to the fact that services are conventionally regarded as intangible, instantly consumed and non-durable by nature (see section 2), one of the approaches for defining services output in national statistics has been (and still is) from the perspective of

5 This framework is attributed to Solow (1957).

6 Applying such a dynamic perspective to productivity, we can have a case where labour productivity (LP) have increased, but total factor productivity (TFP) has decreased (Case 3), or a case in which LP has increased, but no change in TFP (Case 2), or a case in which both LP and TFP increases (Case 1 and Case 4).

	↖Y	↖L	↖K	↖I (E+M+S): Intermediates	↖LP	↖TFP
Case 1	20%	10%	8%	0%	10%	2%
Case 2	0%	- 5%	5%	0%	5%	0%
Case 3	- 5%	- 10%	5%	-5%	5%	- 5%
Case 4	20%	5%	5%	4%	15%	6%

'transactions', as opposed to a more quantifiable measure such as goods produced in the manufacturing sector. However, for analytical convenience, national accounts operate with a 'volume'-measure of services output as in the manufacturing system. Whereas volume in manufacturing is based on more quantifiable goods or materials, in services it is measured as number of service transactions undertaken weighted by prices (e.g. turnover at constant prices). Both value added and productivity measures of services are based upon such measure.

Manufacturing volume (Y) = goods produced * price (p)

Services volume (Y) = service transactions undertaken * price (p)

However, valuing services using this type of volume measure is rather problematic. There are several reasons for this.

Deconstructing services output

In the 'transactions notion' of services, the argument from the Adam Smithian and Karl Marxian's heritage is that service output can only be considered as transactions, as it does not involve or result in some change of state in materials or energy, as opposed to manufacturing and agriculture. As mentioned previously (section 2), it follows that services are classified as everything that is not manufacturing or agriculture as it is not able to add value to materials. The Adam Smithian and Karl Marxian's heritage also embodies how service delivery is not distinguished from the consumption of the service itself. That is, all services are defined as instantly consumed. This measure of services also builds upon the notion that services are non-durable. Those views are embedded in the way mainstream economics and many associated statistics today conceptualize services.

Hill (1977) proposed an alternative concept of services, defining it as 'a change in the condition of a person, or of a good belonging to some economic entity, brought about as the result of the activity of some other economic activity, with the approval of the first person or economic entity'. A change in condition can be the result of a service such as a haircut, or attending a class. Whether or not the person benefits or derives pleasure from this activity is irrelevant to the fact that a service was provided.

Along these lines, we will illustrate how services output should *not* be considered as only transaction processes that do *not* involve or result in some change of state in materials or energy, and how service output is *not* always intangible and instantly consumed (i.e., a non-durable).

Figure 1
Services production deconstructed*

Objects	Nature of transformation	Transformation sphere
• **Artefacts**	• **Physical**	• Time
• **Actors**	• Biological	• Space
• Nature	• Social	• **Instantaneously**
• Symbolic material	• Abstract	

Note: *Conventional view is highlighted in bold.

For the purposes of understanding service output or services processes, we have here more generally defined services as objects (material or immaterial/tangible or intangible) that experience transformations (permanent or not permanent/durable or non-durable) within certain spheres. See Figure 1.

As an illustration of Figure 1 it becomes clear that the service sector is very heterogeneous. First, there are many different objects of services. We have categorized them into *artefacts* (e.g. food, waste, things such as cars), *actors* (e.g. firms, people, animals), *nature* (e.g. water, air, energy), *symbolic material* (e.g. information, ownership rights, performing art). Second there are many different natures of the transformation. They can be *physical* (e.g. haircut, transport), *biological* (waste disposal, cleaning, energy, some medical services), *social* (e.g. change in social relations such as ownership rights (retail), or therapy) as well as *abstract* (e.g. entertainment, education). Finally, the service transformation sphere can be *over time* (storage services in general of which financial services provide and example), *across space* (energy and information, transport and logistic services, telecommunication, and broadcasting) and *instantly* (i.e. services production and consumption cannot be separated over time or across space such as e.g. hair cutting, live entertainment).

Furthermore, there are many different routes in which services and manufacturing objects (material or immaterial/tangible or intangible) experience transformations (permanent or not permanent/durable or non-durable) within certain spheres.

- For example, broadcasting services may be a musical composition on a CD (object = symbolic material and artefact), which through satellites or cables (transformation = physical) are broadcasted (sphere = space). However, if we consider a live concert instead, the object of the service may be both the musical composition and the performing artists (object = symbolic material and actors), and the transformation may be ways in which the artists deliver the musical composition (transformation = abstract), and finally, the service transformation (i.e. delivery) and consumption cannot be separated in time and space (sphere = instantly).

Another complexity is that a service may typically involve:

- A mixture of service object-entities (e.g. an environmental/milieu service may involve a mixture of artefacts, actors and nature; a business service may involve a mixture of actors and symbolic material).

- A mixture of types of transformations (e.g. cooking and gene therapy involve both physical and biological transformations; a hair-cut and a tattoo can involve both a physical transformation as well as abstract (e.g. social political attitude) transformation, which even may involve a social transformation with respect to social relations.

- A mixture of transformation spheres (e.g. space and time in air-transport as well as storage services).

A general point we wish to make here is that services output involves a broader and more complex spectrum of objects, types of transformation, and spheres, than what have been addressed in the mainstream literature and conventional statistics. The ways in

which mainstream literature and conventional statistics have dealt with services with respect to these issues are highlighted in bold in Figure 1. This, in its turn, has created an imperfect picture of the way services have been conceptualized and ultimately measured in the economy.

Furthermore, we find that although classification schemes of services (and manufacturing for that matter) may provide some analytical convenience in pursuing product groups, markets or users (see section 2), they are inadequate in illustrating the character and dynamic elements of the services processes and they should not be used for this purpose.

Defining services units and implications for measurements, including the role of customer involvement and heterogeneity

Quite often, the units of service transactions are not clearly definable in measurable terms (e.g. performing arts, media and broadcasting, financial services), as in manufacturing where the physical state of output can be more clearly measured in tangible elements of production. This is especially due to the intangible nature of some (though not all) services.

This intangibility makes it difficult to quantify and sometimes even *identify* an industry's output in terms of transactions, often because we are not always clear what the output of the industry constitutes. For example, what is the output of bank? What service does it actually provide? Is its primary service the provision of customer accounts? Loans? Or providing an optimal portfolio? Depending on which way the primary service is viewed will determine a different mix of outputs and inputs. As described in Sherwood (1994) there have been two varying ways of measuring the output of the banking industry based how the services of a bank are viewed: the production approach and the financial intermediation approach.

In the production approach, the bank's primary services are viewed as loans and customer accounts. In this approach, output is measured based on the number of 'account transactions' carried out for each product. Thus, emphasis in this approach is on the number of *transactions* (i.e. volume) associated with each one of the services (checks cashed, electronic [ATM] transactions, loans dispersed). These transactions are physically counted to obtain a measure of output. Demand accounts are also used as inputs to provide funds for the banks to use as loans, etc. Consequently, demand accounts are used as both inputs and outputs.

In the financial intermediation approach, the primary service of the bank is viewed as selecting the optimal financial portfolio for the customer. Thus, in this case output is based more on *value* rather than transactions. Output is defined as the *value* of loans and investment, regardless of the number of transactions. In this case as well, demand deposits would be deemed as inputs.

Thus, depending on how one perceives the service of an industry, this will alter the output measurement. Sherwood brings out another difficulty in determining a service, i.e. the role of customer involvement. 'Goods' producing industries manufacture an output, which is then sold to the market. Even if no one purchases the product, the industry has still generated an output, which can be stored in inventory. But what happens in the case of a service where the role of the consumer is implicit in determining the output? Take the case of a teacher who teaches to an empty classroom,

in this extreme case there is no output because there was no consumer involvement. But, put just one student in the classroom and an output is produced. It is the same teaching, and the same service, but without a consumer involved in the process there is no output.[7]

We also have to consider heterogeneity of units even within types of services. Service units are generally not homogeneous (except for energy) as manufactured goods due to the personalized aspects of business services (e.g. banking and finance) and consumer services (e.g. medical care, cleaning, and computer services). This is especially a problem for the volume measure in which we aggregate number of transactions undertaken, and it is subsequently a problem when calculating productivity, which must be based upon such assumption of homogeneity of services units if it shall be taken serious as a perfect measure. That is, industry or sector productivity measures are not appropriate for industries with high degree of heterogeneity. Here services must be viewed in sharp contrast to manufacturing where output is generally identical due to mass production.

This concept of the aggregation of heterogeneous services is referred to as 'bundled services'. The difficulty in the measurement of bundled services is identifying and then finding some way of aggregating these diverse units. For example in the banking industry, a checking account may provide services such as online banking, the use of ATM and bankcards, safekeeping of funds. All of these services must be aggregated in such a way to take into account their heterogeneous nature.

Additionally, there is also a quality component involved. How to aggregate services with varying levels of quality? If a bank adds 100 more ATM machines in the surrounding area for customer convenience, then a characteristic of the service has changed and must be accounted for by 'unbundling' this component of the service. This of course is a difficult process, since this particular service is not individually priced in the overall price of the checking account. This concept of quality will be discussed more in the following section.

Managing price (p) levels

In order to compare any output measured in volume (number of output or transactions weighted by price) of any good or service over sections over time (c.f. the mainstream view of productivity), this requires the price component of output to be removed (i.e. the relative prices are constant). This is usually done by deflating a nominal output measure (such as GDP, sales, revenue) with a price index. However, such deflation becomes tricky because price indices are often not available for many of the intangible services that we have specified. Additionally, as mentioned above, when services are bundled, we need to price each individual service separately, *and* adjust the price indices for any changes in quality.

Another price related issue, is that quality changes do not directly show up in the conventional output and productivity measures, but need to be managed through the price level (see below).

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7 Due to the Karl Marxian and the Adam Smithian notion of simultaneous and instantaneous service production and consumption, see section 2

Quality, aesthetic value and time

The volume measure of output does not capture the effect of quality changes of the good or service, unless it shows up in the price measure (recall volume = services transactions * price). Conventional measures of price movements (consumer price indices, producer price indices) do not take into consideration the changes in the quality of the good. A classic example is that of the personal computer, although computer prices have decreased steadily, the quality of computers have continued to increase over the years. Thus, the price does not reflect the change in quality of the good or service and using a simple price deflator will not adjust for this quality phenomenon. Hence, since output is in volume terms, the same volume of output of computers in 1980 will seem greater than today. For example, it has been argued that (in 1980) the price decrease in the market for computers underestimated the production volume, and hence productivity by more than 300 per cent in (Baily 1981). This was at the time the market for personal computers (PC) matured.

This has lead to the concept of hedonic pricing, which takes quality into consideration. Basically, it is a statistical technique that is used to derive the relationship between a product's price and its characteristics. It is used to adjust the price index so that it removes the effects of variation in quality over time. Not using hedonic prices will underestimate the output measure based on the volume of goods and services produced if there has been an increase in quality of those goods and services produced. This is of particular importance regarding the increased quality of health and computer services, which have both been underestimated.

Hedonic pricing is more widely used in the United States to deflate output in industries where rapid technological changes have occurred, such as health services and telecommunications. Thus, when estimating productivity for these industries, one gains a more realistic picture of output changes, which is reflected in higher productivity figures. The effect is also to raise the average rate of productivity growth for the country. Such measures are not generally taken into account in many European countries including the United Kingdom, and this may be one of the reasons why their economies seem to lag the United States. The British Office for National Statistics (ONS) recalculated productivity growth in the computer industry using hedonic pricing and found that the growth rates tripled for the last four years.

Eliminating the impact of technological change and other advancements in services intermediates (I)

Services play an important role as an intermediate input for much of the manufacturing sector, and indeed also for many services sectors. Drawing upon input-output tables Tomlinson (2000) points out the great extent to which services today function as input into both manufacturing as well as other services activities. But as advancement or quality increases in services input into other sectors are not explicitly recorded (unless it shows up in the price index), it is hard to see what created the value added or productivity of the using industries. Also, a problem arises if the price for intermediate services input falls (which should reflect a progress element). This will instead show up as productivity increase in the manufacturing or other sectors using the cheaper services input. It is well known that services play an important role in national systems of production and innovation, but our measures available do not take such complex systems into account. Hence, such complexities are extremely important in the discussion of services being unproductive in comparison to manufacturing.

That services themselves are an important element in the economic systems enabling productivity for non-service activities, is particular a point which is explicitly acknowledged in the literature on knowledge intensive business services (KIBS). Miles *et al.* (1995) showed how producer or business services together with public services have grown since the postwar period to about 50 per cent of all services activities. Griliches (1992) argues that measuring GDP-by-industry and hence productivity correctly requires at the minimum a set of input-output tables in order to understand where the productivity increase originated.

Any problems associated with output measurement will feed into intermediates, since the output of many service industries is largely consumed by other industries. For example 80 per cent of output in the business services industry (lawyers, consulting, etc) is delivered to other industries (Triplett 1999). What this means is that if output is overestimated in business services, productivity will be underestimated in the industries (including services) that use the services as an input. This offsetting effect at the industry and aggregate level has been discussed by Blinder (2000), and he uses it as the basis for the argument that the productivity in the service industries is not underestimated overall.

The bottom line is that the economy experiences a complex division of labour, distributed across various sectors, in production of both goods and services. Hence, in order to understand economic performance indicators (including value added, productivity, innovation and associated knowledge generation) this division of labour also needs to show up in the statistics. We cannot measure and understand the performance of the economic system in sector isolation.

E-business and the transaction multiplier effect

The discussion of the appropriateness and problems regarding the 'transaction'-perspective for measuring output and productivity in the services literature is also relevant for e-business. Measurement issues regarding e-commerce based sectors has not been finally addressed or solved. However, the problem has been taken seriously by national governments. The UK National Statistics has set up a new division called 'New Economy Measurement Department' that specifically focuses on issues regarding measuring e-commerce. They are in particular concerned with the 'micro aspects' of measuring e-commerce performance, as they believe that this is the key to understanding the dynamics and value added of the new sector, and what difference it makes. In the US, e-commerce performance has so far been measured in terms of *transactions undertaken* (just as services are measured in terms of transactions undertaken (as opposed to goods produced as within manufacturing). This is at least the definition or approach the US government is taking (Mesenbourg 2000).

Therefore, if we wish to understand the role and scope (e.g. value added, growth, productivity and overall performance) of e-business to the full economy, we can learn a lot from the problems raised in the services literature.

Also, as many knowledge intensive business services are mainly processing and managing information, such activities have seen a great scope for integrating electronic business (e-business). It has even been identified that e-business output (measured as transactions undertaken) and e-business labour is growing faster than traditional manufacturing (Cisco Systems and University of Texas 2001). In this respect, there is of course a great overlap in activities between e-business (which is a process, a way of

doing business) and the service sectors. Hence, the growth of services (now about ¾ of the economy in industrialized societies, as identified above) also reflects the implications of information and communication technology (ICT) and the growth of e-business processes, and *vice versa*.

An additional complication to the problems of the transaction notion for e-business (i.e. in addition to all those mentioned in relation to services below) is that e-business includes 'multiple e-commerce transactions', even if it is done via the 'one click' system. For example, if you buy a book online via e.g. Amazon.com, this includes following transactions: (i) your purchase of the book; the firm's separate transactions with third parties to obtain fulfilment services, which include: (ii) acquiring the book, (iii) secure credit confirmation service, (iv) provide payment processing service, (v) arrange for delivery, … and many more. The complexity is that such online network integrated transactions involve many parties and some play multiple roles.

Mesenbourg (2000) argues that any business-to-consumer transactions will involve a larger number of related business-to-business transactions. Although this transaction multiplier effect is not unique to e-business, it is expected to increase with e-business. Today we have e-commerce transactions between 'brick'-firms, 'click'-firms, and 'brick and click'-firms. The measurement challenge here is to account for the increased volumes in transactions, to identify the business players and their roles and their respective industries and to avoid double counting the value of related transactions. While comprehensive measures of e-commerce may be useful to profile all of these transactions, such detailed business statistics coverage would be unprecedented and unrealistic, as argued by Mesenbourg (2000).

4 Labour force measurements (L) in services

The labour measure used in the calculation of production growth is generally quantified in terms of total hours worked (total employment * hours worked). This measure is more reliable than using a simple measure of 'number of workers'. The number of workers does not reflect the input of labour accurately because it does not account for the *intensity* of work performed. Consider the case where an additional worker is hired but as a result the workload of the other employees is reduced. In this case the number of workers has increased but total man hours worked of all employed may not have actually changed. Thus, using a measure of number employed (and assuming no change in output), productivity growth can over or underestimate the true productivity growth, depending on the actual hours worked.

Conceptually (or theoretically), *labour hours worked* is an important variable in the measurement of total factor productivity. However, in contrast, in many empirical calculations of productivity *hours paid* is often used. This is because data on hours paid are more easily obtainable from the national statistical agencies. The implications of this are also mainly a problem for measuring the service economy. The differences in each are discussed below:

– *Hours worked* reflect the actual number of hours that an employee has worked.

– *Hours paid* include pay for vacation, holidays and sick leave. This *overstates* hours worked and *underestimates* productivity measures.

However, particularly in the service industries, both measures tend to underestimate the *actual* hours worked. It can be argued that actual hours worked as well as hours paid should include work performed after hours, work at home, work on airplanes during travel and in hotel rooms, as well as usages of cell phone for working activity—all of which are activities directly associated with work. However, none of the measures take that into consideration in the estimates of hours worked. The ICT revolution in digital technology has increased opportunities for such new ways of working for KIBS. Many service employees are working more hours than are documented in the official numbers. Consequently, the omission of these additional working hours, overestimates productivity growth measures.

The United Kingdom, United States, and Canada provide actual hours worked in their national statistics. They base their measure on 'household surveys' carried out by the relevant statistical agencies. However, most countries do not base their productivity measures on actual hours worked but instead rely on establishment surveys[8] to arrive at a measure of hours paid.

4.1 The variety of labour force surveys

As you can well expect, there are discrepancies in the employment figures between the household and establishment surveys due to differences in sampling techniques, collection, and estimation methods. Household surveys measure *hours worked* by going to residences and asking how many hours were worked by members of the household. In this context household surveys counts people (not jobs), and an individual with more than one job is classified in the job where they worked the most hours. Establishment surveys measure *hours paid* by going to the job and asking the number of hours paid. In this context establishment surveys counts jobs, and the survey will count two jobs, regardless of whether it was held by one person (which accounts for approximately for 5 per cent of all persons in the labour force).

4.2 Establishment versus household statistics

When empirically addressing the form, function and impact of services it makes a difference if we use establishment or household statistics. However, when available, in practice the two surveys are combined for productivity measures. In such cases, the hours worked data are obtained from the household surveys, while the labour employed data is obtained from the establishment surveys. Although this creates a bias in the measurements, it gives a better reflection of the total hours worked than relying on only one of the surveys, because the household survey underestimates employees (c.f. it only counts your primary job), while the establishment survey overestimates hours worked (c.f. it counts hours paid but not worked).

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8 An establishment is defined here as an economic unit that produces goods and services at a single location and is engaged in one type of economic activity; it need not be a firm, but may be a branch, plant, or warehouse.

4.3 Quality of labour force

We would also argue that the quality of work in services (i.e. the services labour force) is not being measured properly. That is, we believe that improvements in the quality of labour through education and training ought to be reflected in the labour statistics.

Also the services labour force is not homogenous, and quality of hours worked may differ dramatically. If one should measure the output of a law firm, should the hours worked of someone straight out of law school be counted as the same as a more experienced attorney? At which point do the skills of workers begin to diminish? Is this impact different across industries and sectors. These questions are all relevant for productivity analysis because of the way that the labour measure is constructed. Basically the labour force index used in productivity analysis is a macro index, accounting for workers with different skill levels, different education levels and different ages, etc. In order to be measured properly, the index should be weighted to take into consideration the heterogeneity of those employed. Within the service sector this could be a larger problem than manufacturing, as many services are custom based between individual service provider and service client so the tasks and skill levels of workers are extremely varied, whereas within manufacturing you are more likely to produce to a market with more standardized entities on both the supply (e.g. along resample lines) and demand side.

Jorgenson *et al.* (1987), Jorgenson and Fraumeni (1989) and Rosenblum *et al.* (1990) have all done pivotal work in this area. Cost-weighted shares based on wage date are generally used for aggregation of the heterogeneous units, however this does of course assume that wages are a proximate measure of skills.

5 Knowledge intensive, specialized and innovative

The next somewhat problematic issue in this field is the lingering conventional theories that claim that services are labour intensive (associated with being unskilled) and inherently of fixed labour productivity in their exposition. Certain stylized facts can be raised in relation to this:

5.1 The heritage from the past

The long-standing notion of services being (unskilled) labour-intensive and of inherently of fixed labour productivity is historically based upon the personal element of services (i.e. serving the upper class) or that it is craft based. Both did not involve the traditional notion of being capital intensive (often associated with specialized education) and they involved a limited or fixed division of labour, as opposed to major manufacturing processes. This is clearly a sign from the time the *physiocrats*, Adam Smith and Karl Marx wrote that services were generally based upon what we today determine as ‘consumer services’ or ‘personal services’ (see section 2 on services classifications).

5.2 Knowledge based and specialized

The development of ICT hardware, and increasingly sophisticated applications software, has transformed many services to become divisions of specialized knowledge. This has resulted in that service functions have been outsourced from manufacturing and it has created new services (Miles *et al.* 1995, Howells 1990). Such outsourced specialized knowledge sectors in particular involve KIBS, including finance, accountancy, law and insurance. These also include communications, transport (logistics), cleaning and many administrative tasks, not to mention the development of 'self-service'.

Clearly the intangible nature of many services poses considerable problems for the identification and measurement of specialized knowledge. Especially, since many of the objects and transformation processes in services are not based upon science and technological knowledge or developed through research and development (R&D), the question of appreciating other forms of knowledge types as an alternative to the traditional measurements arises. This is especially relevant for understanding the types of innovation processes in new service economy (see section below).

As a starting point we have tried to classify the types of knowledge involved in understanding services objects and services transformation processes. We have grouped six types of knowledge that can be said to be important for some and perhaps even most services.

- *Aesthetic knowledge*: I.e. knowledge and appreciation of craft related services; for example, hair dressing, performing art (e.g. music), web-design services, painting and cooking, etc.

- *Know-how*: This type of knowledge is sometime the most important knowledge resource, e.g. in entertainment (e.g. a comedian's know-how in making people laugh, sport (e.g. a person's know-how in playing football), retail (e.g. a sales assistant know-how in selling). Know-how can also be related to many managerial services where know-how can be the most important knowledge resource. It is here basically about knowing how to coordinate various knowledge domains in a successful fashion.

- *Cultural knowledge*: I.e. knowledge and appreciation of institutionalized cultural aspects of services: This is intertwined with market awareness and appreciation of the dynamics and interests of subcultures and associated practices as well as intertwined with knowledge about symbolic material. (Here the cultural aspects include everything from ethnic group cultures to business culture, leisure culture, shopping culture as well as other subcultures). This aspect is very important as most services are client based, whether it is a business service or consumer service.

- *Social, organizational, and strategic management knowledge*: I.e. knowledge about organizational dynamics in a changing world, including knowledge about administrative structures and procedures that, for example, applies to knowledge intensive business services, whose business processes are mostly ICT based, given great scope for linking up and integrating agents within (and across)

service production, service delivery, service consumption as well as agents capturing returns from those.

- *Information based knowledge*: This type of knowledge is associated with services whose key competence is knowing and handling a lot of information material such as institutional and legal knowledge (e.g. law). This type of knowledge is especially relevant with respect to governmental and many public services, environmental services as well as financial services, insurance and real estate services (FIRE) and other business services. Those bodies are often central agents standing halfway between the legal and financial systems, and cover both the macro and micro aspects of the economic system.

- *Finally there is, science and technology (S&T) knowledge*: I.e. knowledge about problems that may be presented by technological change concerning service production, service delivery, and service consumption as well as ways of capturing returns from services. This also includes knowledge of how to apply new science and technology to those aspects of services, as well as knowledge concerning future possibilities for such applications. This is the only type of knowledge that is taken into account (when measuring services knowledge bases and in innovation statistics) in conventional economics and national statistics.

It is a major problem that we have not found good ways for measuring the innovativeness in non-science based fields, as we miss many of the most central aspects of human resources and dynamic capabilities in the new service economy. Most innovation measures are very S&T based (such as patents and R&D), but it is evident that this is inappropriate for services firms, which require so many other knowledge sources, and which innovate in so many non-science based fields.

The types of knowledge bases listed above can be grouped on a scale from private knowledge to more public knowledge in which aesthetic knowledge and know-how can be regarded as mainly *private* service-related knowledge, cultural knowledge and social, organizational, and strategic management knowledge can be regarded as mainly *less private* service-related knowledge and finally science and technology knowledge and information based knowledge as *more public* service-related knowledge.

Hence, we can see how the knowledge bases of services differ from manufacturing which is mainly based upon science and technological knowledge. The increased outsourcing of the services knowledge base from manufacturing may be a reflection on how the services knowledge base has become higher skilled and increasingly specialized.

5.3 Innovation in services

Appreciating other knowledge types as an alternative to the traditional manufacturing is especially relevant for understanding the types of innovation processes in new service economy. Consulting the knowledge base of many services (as identified in the above section), this also suggests that innovation in services is likely to be of quite different nature in comparison to those of manufacturing. They would also call upon different kinds of knowledge generating institutions from those emphasized in relation to the manufacturing sector.

In this context, an OECD Services Working Group working to revise the Oslo Manual (OECD 1996) similarly asserted the inadequacies of innovation measurement and data collection for services. The argument is that innovation indicators that had been developed, maintained and focused on manufacturing did not effectively capture innovative activity within service industries (OECD 1996: 1). Though a variety of innovation indicators that have been used to assess innovation, such as research and development (R&D) data, patents and high technology trade-flows, together with more recent developments around bibliometrics and citation analysis, these indicators have been largely focused on manufacturing industry. R&D statistics have only recently been extended to cover services, and are both believed to underestimate the amount of research and development activity in the sector. This is mainly due to the fact that service firms do not recognize when they are doing R&D as they typically do not organize research and development though the conventional system of R&D departments. Also, patent data's applicability to most service sectors is even more limited, although there is some evidence to suggest that patenting activity by service firms is on the increase (Miles *et al.* 2000). Thus although existing data are in many respect very comprehensive technological indicators, they do not cover many aspects of the new knowledge economy surrounding the growth of new knowledge and technology intensive service sectors based on electronic information technology.

Although it is difficult at this point to conclude much concerning innovation processes within services and associated indicators, it is clear that they involve, at least in some crucial cases, a combination or articulation of different types of knowledge which often have roots in different types of arts and sciences.

De la Mothe and Paquet (1997) suggest that new modes of production of knowledge have evolved whose success depends on social cohesion, trespassing and crossing disciplinary fields, better networks and communication. In the same context Andersen *et al.* (2000) and Miles *et al.* (1995) illustrated how the service sector has come to play a central role in transferring, and in many cases creating and combining, knowledge resources in innovation systems. They are doing this directly through their provision of service.

The bottom line here is that both indicators of innovation within services and the forms of innovation processes in services are very different from manufacturing, but as such variables have been conceptualized and measured around problem-solving for science and technology (S&T) based manufacturing, they do not capture services as being innovative. Employing a broader approach to the definition of innovation, the SI4S survey (Miles *et al.* 1995) funded by the European Commission demonstrated how services are being skilled and innovative. This applied to 49 per cent of all service firms on average over the period 1994-96, and 62 per cent of the sectors 'information and technology services' and 'financial services'. Hence, just as productivity measures suffer from manufacturing concepts being applied to problem-solving for services, innovation measures are also highly manufacturing originated

6 Services impact on global systems

Services impact on and the role in global systems have also been a highly topical issue. Whereas, (i) economists have been concerned with internationalization of services trade,

(ii) geographers have been concerned with globalization of networks made feasible through services, and *vice versa*, and (iii) business managers have been concerned with foreign direct investment (FDI) and transnational activities by service MNEs.

6.1 Traded internationally

Services have historically been regarded as not tradable internationally, in the sense that services itself cannot move (only labour which provides the service can move). However, services have now more recently become non-localized and a part of traded products, partly due to heavy use of information and communication technology (ICT), integrated with strategic information system management. This include financial services, insurance, real estate (FIRE) and other business services. Also cultural services and entertainment have become international due to ICT in the way such services are created, delivered (e.g. broadcasting) and consumed. Finally, many other services such as retail, education and medical services, e-government are provided through interactive web services.

6.2 A generator for international transactions

In general we should not forget that international trade is made feasible only through the service sector. E.g. growth in insurance services facilitated growth in shipping services during the industrial revolution (Adam Smith 1776), just as web services have supported the growth of e-commerce (Flanagan *et al.* 2000). Dunning (1989) argued that especially increased complexity and uncertainly of the (international) market have led to increased use, trade and specialization of business services such as insurance and professional advisory

6.3 Establishing global networks

Geographers have been looking at how the role of information and communication technology (ICT) provided by services has changed the dynamics of local environments and created inter-organizational global networks in services as well as manufacturing (see e.g. Howells 1990 with respect to global R&D networks provided by ICT in pharmaceuticals and chemicals).

6.4 The foreign direct investment (FDI) alternative

There are many types of services which do not enter international trade. However, multinational enterprises (MNEs) in particular have been the preferred route for organizing cross-border activities involving services and their growth has been revolutionized during the last few decades (Dunning 1989). It is especially the rise in real income and technological advance in telecommunication, which have increased the demand and made possible the international supply of services. MNEs relative to other firms have been well placed to benefit from these developments (Dunning 1989). Such MNE based services especially includes those where (i) international transaction costs (either by consumer or provider) are in practice too high or (ii) local bound services which require simultaneous service production and consumption (e.g. car hire chains, chain hotel and other tourist facilities, media, construction and development services,

business services, etc.). Also, there are intermediate services, which are widely transferred with MNEs such as FIRE services, and other business services. A point made by Clairmonte and Cavanagh (1984) is that, whereas economies of scale generally can be realized in manufacturing industry by the production of a large number of standardized units in one location, in services economies of scale is achieved by organizing individual units (e.g. into chains) and managing them through centralized or decentralized (or both) networks, and that this is what MNEs are good at.

As we can see, it is the role of ICT in services and the rise in real income (economic wealth) that provide global networks for most service sectors of the economy, including service trade and services production and consumption. Some go so far as to link this to a new economic paradigm named the *post-industrial society*, the *Fifth Kondratieff*, the *weightless economy*, the *network economy* and more recently the *knowledge economy*.

7 Conclusion

Using conceptual frameworks, indicators and measurements developed around problem-solving for manufacturing, it is not hard to see how services output and related performance measures have so often been misjudged as being unproductive and not innovative. However, this is not just a data collection and analytical problem, but also a political issue. E.g. the discussion raises the question of government not being able to design policies based on illusive statistics.

By systematically addressing and putting into context some of the most prominent points raised in the theoretical, conceptual and empirical literature, it is hoped that this paper will move us a step forward in clarifying our theoretical and empirical understanding of the role and scope of services in the new economy.

A way of making the general point is that, what is uniquely challenging about the new service economy lies in the difficulty of defining unambiguous measures and micro-economic relationships.

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