

HISTORY AND MEASUREMENT IN THE SERVICE SECTOR: A REVIEW

Economic Council of Canada, *Employment in the Service Sector*, Minister of Supply and Services, Canada, Ottawa, 1991.

Delaunay, Jean-Claude, and Jean Gadrey, *Services in Economic Thought: Three Centuries of Debate*, Kluwer Academic Publishers, Boston, 1991.

Griliches, Zvi (ed.), *Output Measurement in the Service Sectors*, NBER Studies in Income and Wealth, Vol. 56, University of Chicago Press, Chicago, 1992.

1. INTRODUCTION

All three of the books reviewed here are concerned with services, but the focus of the three is very different, and taken together the amount of material covered is substantial. This brief review cannot hope to do justice to this wealth of information, and thus we focus our attention on a few specific topics. We first set the stage for the review by discussing the definition of services and their measurement. Sections 3 and 4 provide some historical background and document the growth of the service sector. Section 5 reports on output and productivity measures, section 6 reviews other service sector issues, and section 7 concludes our discussion.

2. WHAT ARE SERVICES AND HOW SHOULD THEY BE MEASURED?

One of the first difficulties that practitioners encounter in attempts to measure service output is deciding exactly what services are and how they differ from goods. In his introduction, Griliches provides a definition from the Webster's dictionary that suggests that services are the result of labor that does not produce a tangible commodity, and includes as examples such activities as railroads, laundries, and physician services. One of the most complete discussions of the distinction between goods and services is contained in T. P. Hill (1977), where a service is defined as "a change in the condition of a person, or a good belonging to some economic unit, which is brought about as a result of the activities of some other economic unit, with the prior agreement of the former person or economic unit" (Hill, 1977, p. 318). Other definitions include "services are consumed as they are produced and so service consumption and production are aspects of the same process" (ECC, 1991, p. 7). ECC then suggest four distinctions between goods and services: 1) tangibility vs. intangibility; 2) no direct contact

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vs. direct contact between the producer and consumer; 3) transferability vs. non-transferability; and 4) storability vs. nonstorability (ECC, p. 7).

Although many authors introduce the topic of measurement of service output and technological change with a brief discussion of the definition of services, most soon move on to other matters, arguing that what is really important is which activities are regarded as services. As stated by Griliches, "rather than discussing definitions, it may be more useful to take an operational approach and to examine what are actually called services in the national accounts and related statistical sources" (Griliches, p. 6).

There are good reasons not to become preoccupied with the definition of services. Since services include such a wide variety of activities it is difficult to get any agreement on a definition. As Inman (1985, p. 4) suggested, "like beauty, the definition of a service activity is often in the eye of the beholder." Furthermore, most researchers in the area quite properly see their goal not as defining services but rather as making progress in the measure of their output and productivity. While it is certainly true that a definitive definition of services is not the ultimate goal of service sector research, I believe that the lack of a firm understanding of what service industries do, and in some situations the failure to distinguish between the output of services and the things being serviced, has exacerbated the difficulties associated with measurement. It may therefore be valuable to spend some time trying to ascertain exactly what services are.

I have argued elsewhere (Melvin, 1989, 1990) that, at least in some circumstances, it is helpful to think of services as activities that are associated with the dimensionality constraints imposed by time and space. There are certain activities that require the double coincidence of time and space. For personal services such as haircuts and medical procedures such as appendectomies, producers and consumers must be at the same place at the same time. These are activities where direct contact between producers and consumers is required and these can be defined as contact services. In many areas, technological change has allowed us to overcome these dimensionality constraints. If one were asked to list the major advances in service industries over time, one would probably include the invention of the wheel, the switch from sailing ships to steam, the spread of the railroad, the invention of the airplane, the invention of telegraph and telephone, and more recently, the development of computers and fiber optics. All these activities have improved our ability to overcome the constraints imposed by space. These are activities that can be called intermediation services.

Thus we have at least two very different types of activities related to dimensionality that we call service. For activities where we have not been able to break the double coincidence of time and space, the activity itself is called a service. For activities where technology has allowed us to loosen the dimensionality constraint we refer to the activity that has permitted this separation as a service. While these dimensionality-related activities are services, this classification is certainly not all inclusive. For example, while time and space produce constraints that must be overcome by economic units, so does the absence of perfect knowledge. Services such as lawyers, accountants and insurance brokers can be seen as helping to overcome ignorance constraints. In the discussion here we will be primarily concerned with intermediation services, but other types certainly exist.

The transportation industry provides a service, but should we always regard the transportation of goods between two locations as constituting a transportation service? I think it is important to distinguish between a service activity and a service industry. It has always been possible to transport apples from location A to location B. One could, after all, carry them. But should we regard such activities as a transportation industry? It would seem reasonable, although perhaps somewhat arbitrary to define a transportation sector as existing if we have some third party that carries out this transportation, or, in other words, if we have intermediation.

An important group of service industries exists to provide intermediation. The wholesale and retail sector intermediates between producers and consumers. The transportation sector intermediates over space between producers and consumers in different locations. A principal activity of the banking sector is to intermediate between borrowers and lenders. Transportation has always existed in some form but a transportation industry has not. If the transportation industry were to disappear, transportation would still take place although the activity would be much less efficient.

It is also important to distinguish between the output of this intermediation activity and the thing being intermediated. For some service industries this distinction is clear and few difficulties arise. In considering the transportation of apples from New York to Winnipeg one would not consider the apples as the output of the transportation sector. When studying the activities of a retail outlet one does not consider the product sold as part of the output of the retail store. As we shall see subsequently, however, this distinction is not so obvious and not so carefully made in some of the other service industries. Throughout this discussion we take it as given that for intermediation services it is the intermediation itself that is the output, with the price of the output being the intermediation cost, or the difference between the price paid by the demander and the price received by the supplier.

In addition to the problem of defining a service activity is the question of which activities should be included in the service sector. The classification of most industries is obvious, but some are more problematic. For example, national accounts of most countries classify utilities (natural gas, water, electricity and sanitary services) as services, and the ECC study and the three general papers in the Griliches' volume (Mohr, Dean and Kunze, and Armknecht and Ginsburg) follow this tradition. How one should treat utilities is an interesting question, for while gas, water and electricity are clearly goods (and sewage clearly a bad) the distribution system for these commodities provides a service. For water in particular one can argue that one pays not for the water but for the service of transporting that water to your home or business. While one can quibble over which industries should be included as services, such classification problems cause no special difficulties.

3. A BRIEF HISTORY

Services have always been with us: The world's oldest profession, for example, is part of the service sector. The history of the development of services, and more particularly the history of how economists and other social scientists have viewed

services makes a fascinating story and one that is skillfully presented by Delaunay and Gadrey. Their story begins in the classical period where particular attention is paid to the views of Adam Smith. Smith was not concerned with services *per se*, but rather made the distinction between productive and unproductive labor. In this Smith follows the Physiocrats, and his views that non-productive spending put restrictions on the formation of capital and therefore slow the development of the economy is reminiscent of the earlier Mercantilist views. The connection with services is that his “unproductive labor” included workers such as the servants of wealthy individuals or of the state. Also included on his list were the military, the clergy, lawyers, medical personnel, writers and musicians, all professionals that we now include in the service sector. Smith’s distinction between productive and unproductive labor was shared by later writers such as Ricardo, Malthus, James Mill, and others. Delaunay and Gadrey identify Heinrich Storch as one of the classical authors who appreciated the fact that service activities did produce value and classified John Stuart Mill as taking an intermediate position.

Delaunay and Gadrey spend a full chapter on the contributions of Karl Marx, perhaps a somewhat excessive allocation given that they conclude in the end that Marx did not significantly extend the debate on services. Of course Marx’s views were important for they influenced the national accounting systems of the Soviet Union and other communist countries, where services were not counted in national output and as a consequence service industries were often neglected. Delaunay and Gadrey then argue that the concern with services diminished until about the First World War by which time *all* activity was seen to provide a service, and the distinction between goods and services was no longer considered relevant. Only the Marxists persisted with the distinction between productive and unproductive activities. The next era in which services rose in prominence was the period 1930–70 with the development of national income statistics. Here the names of Colin Clark, Allan Fisher, and Jean Fourastié are prominent. It was in this period that the national accounts were divided into three subgroups; primary activities, secondary or industrial activities, and tertiary or service activities. This is the period when concern was first expressed about the productivity of the service sector, and when the growing importance of service activities in the economy was noticed.

The classical dichotomy between productive and unproductive work, and the view that only durable commodities lead to wealth formation, and the corollary that any activity that does not produce a commodity is unproductive, seems somewhat strange to us today. Nevertheless in this distinction there may be a hint of one of the defining characteristics of some of the activities that we currently define as services. Consider, for example, the activity of transporting a commodity from one place to another. The transportation does not, by itself, produce utility. Indeed it would be preferable if the producer and the consumer were close enough to each other that transportation would not be required. Transportation exists because things are not where we want them to be, and the production of transportation is wasteful in the sense that it uses up resources that could otherwise be used to produce commodities that would increase utility. In this sense some services are “unproductive” for they do not directly lead to an increase in our welfare.

The other extreme view, that all activity is productive and provides a service, is equally unfashionable, but again there is some justification for such an approach. It is clearly true for any durable good, and is also true for many goods that are not usually considered as durable. We buy clothes because they provide a service by keeping us warm (or protecting our modesty) and we buy food because eating keeps us alive. Of course defining *everything* to be a service hardly helps in our task of differentiating between goods and services and identifying distinguishing characteristics, but this approach does highlight the importance of the earlier question of how services should be defined and how they should be distinguished from goods.

4. THE GROWTH OF THE SERVICE SECTOR

The growth of statistical analysis and the measurements of GNP that gained prominence in the interwar period led to a renewed appreciation of the importance that services played in the economy. The growth of the service industry is well documented in the Economic Council of Canada Report and by several of the chapters in the NBER volume edited by Zvi Griliches. Michael F. Mohr documents the rise of the service industries in the period from 1960 to 1990, and Griliches, in his introduction, dates the beginnings of the acceleration of growth in the service sector to be about 1960. The share of services in GNP rose from approximately 40 percent to 60 percent from 1947 to 1990, while employment in services in that same period rose from approximately 40 percent to around 70 percent. This rapid increase in the service sector raised a number of fundamental questions and spawned several different research approaches. A projection of the service growth rate into the future prompted sociologists such as Daniel Bell (1973), to predict that economic activity would soon be almost completely dominated by the service sector. As noted in Delaunay and Gadrey, Bell predicted that by the turn of the century the industrial sector could be as small as the agricultural sector had become by the 1970s (approximately 4 percent of the labor force). In addition to the rapid growth in the service sector, the Post Industrial Society literature emphasized the important role of knowledge, science and technology, the importance of professional and technical people, and suggested that fundamental changes in the value systems and forms of control in the society were taking place. These are all discussed in Delaunay and Gadrey.

The idea that the economy could soon be dominated almost completely by service-sector industries prompted several forms of response from economists. Delaunay and Gadrey identify two strands of research, the first of which they call the Neo-Industrial Theory of Self-Service, associated largely with the work of Jonathan Gershuny (1978), which predicts that in the future more service production would take place in the home by the consumer using sophisticated consumer capital equipment. The other school, referred to as the Theory of Neo-Industrial Society, includes a diverse group of authors who emphasize, among other things, the important role of services in production and the critical role of technological change in service industries themselves. Also associated with this branch of theory are the authors who identify the information sector as a more important distinction than service sectors themselves. Earlier contributions to this line of thought

include Fritz Machlup (1962) and Edwin Parker (1975). To these two approaches could be added what the ECC calls the “manufacturing matters” debate to which Rudiger Dornbusch *et al.* (1988), and Gregory Schmid (1988) are important contributors.

Even if one is not persuaded that the industrial sector is about to disappear, the growth of the service sector raises several important issues. Early authors on the service industries, including Victor Fuchs (1968) and William Baumol (1967), were concerned not only with the rapid growth of the service sector, but also with the fact that productivity in service industries did not seem to keep pace with productivity in manufacturing. Slow productivity growth in services was seen as a major problem and one that could well have contributed to the overall reduction of the growth rate in major industrialized countries. In his introduction Griliches identifies two possible explanations for these phenomena. The first is slow technological change in services associated with their labor intensity, along with potentially higher income elasticity of demand. The second relates to the difficulties associated with measurement of output and productivity, which may have resulted in a mismeasurement of productivity growth in service industries. It was this second concern that motivated the research contained in the Griliches volume, research that can be seen as an update of the earlier research by Fuchs (1968), also sponsored by the NBER.

The question of why there has been such a substantial shift to service industries is considered in some detail by ECC. They identify and examine four traditional explanations. These four are “first, that consumer demand for services has increased faster than for goods; second, that labor productivity growth has been slower in services than in goods; third, that goods producers are now simply contracting out for services that were formerly produced in house; and fourth, that there has been strong growth in the intermediate demand for services as inputs to the production process” (ECC, p. 31). After examining personal expenditures on goods and services for the period 1971–86, ECC found that the income elasticity of demand for goods was actually higher than it was for services, and both were less than unity. They concluded that there was no statistically significant difference between these two elasticities. They also examined the distribution of total final expenditure by consumers on goods and services and found there was no significant increase, or perhaps a small decrease, in the share of total domestic services accounted for by goods and services. The paper by Alan Heston and Robert Summers in the Griliches volume also adds support to the view that changes in consumer incomes cannot account for the growth of services. They report on some results from the United Nations International Comparison Project (ICP) where cross-section studies on some 60 different countries were undertaken. The countries in the study range from low-income countries such as Ethiopia with a per capita GDP of \$275 US to the United States with a per-capita income of approximately \$12,000 US. One of their most interesting conclusions is that there is virtually no change in the share of services in GDP as GDP per capita increases.

The second possible reason for the increase in the proportion of services in GNP examined by ECC is that the slow growth of productivity in the service sector has resulted in a relative increase in their absolute size. This argument was made by Baumol (1967) and has more recently been emphasized by Baumol,

Blackman and Wolff (1989). These authors describe the phenomena as the “cost disease” and argue that slow productivity growth, by increasing relative cost, has been responsible for the rising share of employment in the U.S. economy. These arguments have been reviewed by Rowthorn (1992), who concludes that while low productivity growth has been an important factor in the growth of services, demand factors have also played an important role. The ECC is also critical of this approach. They divide the service sector into dynamic services, traditional services, and non-market services and argue that, while productivity in services overall has been somewhat lower than in the goods sector (1.4 percent per year as compared to 1.8 percent per year) this has been largely due to a poor showing by traditional services and non-market services. Dynamic services have, in fact, had a larger productivity growth than have goods (2.0 percent year as compared to 1.8 percent). They note that the sector where productivity growth is lowest, namely non-market services with a small negative productivity growth per year, is also a sector that has not grown significantly over that time period. They also argue that there has probably been a bias in measurement of productivity changes in both goods and services, with an upward bias for goods and a downward bias for services. They conclude that very little of the growth in services can be attributed to differences in productivity.

A third possible explanation for the growth of services is contracting-out. The argument is that many firms that traditionally performed service activities in-house have found it more efficient to hire these service activities from independent service-producing firms. Thus firms that at one time employed their own lawyers now use the services of a law firm. In the first case these activities would be counted as output of the industrial sector to which they belonged, while in the second they would be attributed to the service sector. ECC examines this argument, and although they find that there have been some shifts to contracting out, they conclude that this cannot be a major explanation for the growth in the service sector.

The fourth explanation is that the overall growth in services is a reflection of the increase in the demand for intermediate services. This possibility was discussed by Osberg, Wolff and Baumol (1989) and is examined in some detail by ECC. The argument is that the final products included in measures of GNP require a larger input of services than previously. ECC used an input-output model to test this hypothesis and found that there was no substantial increase in the extent to which services were used to produce final output. They thus conclude that although each one of the four possible explanations provides some increase in service activity, taken together they cannot provide a convincing explanation of the growth in the overall service sector. They therefore suggest a fifth possibility related to the “manufacturing matters” argument, originally developed to counter the advocates of the post-industrial society. The argument is that goods and services are very dependent on one another, that the expansion of the goods industries results in an expansion of services, and that the expansion of service output results in an increase in demand for goods. They show that the expansion of goods requires proportionately more services as inputs, and conclude that this interdependence of goods and services, and particularly the fact that the increase in goods production requires the expansion of the service

sector, may account for the increase in the overall proportion that services make up in GNP.

The ECC analysis of the interrelation between services and goods is carefully done, but in the end is not completely persuasive. In particular, even if the output of goods requires the production of more services, this by itself does not suggest that the growth rate of services would be faster than for goods. Moreover, in a recessionary period with a fall in the output of goods, the ECC logic would seem to suggest a proportionately larger fall in the output of services. I am aware of no evidence that suggests that there has been such a relative change in the output of services. I am aware of no evidence that suggests that there has been such a relative change in the output of goods and services in the recent recession.

One of the interesting features of the service economy has been the rapid growth in the service sector that has occurred since the 1960s. Early explanations seem to have taken it for granted that it was demand-driven, but recent research casts serious doubt on this explanation. No other completely satisfactory explanation has yet been provided, however, and thus the cause of the rapid increase in output of the service sector stills remains somewhat of a puzzle.

5. OUTPUT AND PRODUCTIVITY MEASURES IN SERVICE INDUSTRIES

Seven of the chapters in the Griliches volume provide detailed examinations of selected service sector industry. Walter Oi examines productivity in the distributive trades and stresses the role of the shopper and the economics of massed reserves. He emphasizes the importance of inventories held by shoppers and notes the difficulty in drawing dividing lines among the various sectors such as wholesalers, retailers, manufacturers, and consumers. Oi begins his paper by noting that while some direct sales exist "the vast majority of consumable goods are channeled through middlemen specialists who facilitate the movement of goods in time and space" (Oi, p. 161). Oi's paper presents useful statistics on output and productivity in the service sector, but the major contribution is theoretical. As his discussant, Sherwin Rosen points out, "he presents a superb mini course on the economics of retail trade." One of the points made by Oi is that the correct specification of the production function for retail trades must include the consumer as an input. He suggests that this should also be true for education and transport services. The difficulties in distinguishing among the activities of wholesalers, retailers, manufacturers and consumers, leads him to conclude that one should focus attention on final output measures for the sector. As he puts it "a cake on a dinner plate or gas in the tank" (Oi, p. 189).

In a paper entitled "The Real Output Of The Stock Exchange," Timothy Bresnahan, Paul Milgrom, and Jonathan Paul examined the output of the stock exchange and the securities and financial services sector and focused attention on the informational outputs of the stock exchanges. They identified two informational outputs, the first associated with information that would be useful to investors to evaluate management's plans for the firm. The second involved information that would be transferred by the market from firms to investors. In the end they concluded that the informational content of the stock exchange is not very large,

because the information that is valuable in making decisions, such as compensation for managers or decisions on new products, is not related to the information revealed by trades on the exchange.

The paper by Bresnahan, Milgrom and Paul provides a useful contribution to the issue of the informational content of the stock exchange. One wonders, however, whether this approach appropriately measures the service output provided by the stock exchange. Would it not be more appropriate to view the stock brokerage industry as acting as an intermediary between individuals who wish to buy stocks, and those who wish to sell? In some cases these would be trades between businessmen seeking equity capital and investors, while in other circumstances they would simply be trades of shares among investors. The stock brokerage industry serves an important purpose by acting as a middleman for these demanders and suppliers of equities. In such an interpretation output would be some measure of the number of shares traded and prices would be reflected in the brokerage fees. The stock market would not seem to be fundamentally different than the retail markets for cookies, bananas or any other commodity. Here output should be a measure of the number of units sold and the price is the markup charge for the intermediation activity. One possible way of measuring productivity in the stock market would be to see whether the costs of transactions have been reduced over time. Of course, the stock market (and probably other markets as well), produces externalities by providing information on the characteristics of the firms and management of the companies that issue the equities. While this may or may not be valuable it would not seem appropriate to consider this information as the principal output of the stock exchange.

There are two papers in the Griliches volume that address the measurement of output and productivity in the banking sector, one by Denis J. Fixler and Kimberly D. Zieschang, and the other by Allen N. Berger and David B. Humphrey. The former use a translog distance function to produce a banking output index and the latter use a cost function with a thick-frontier approach to measure the performance of the banking sector. At present, national accounts use transactions on deposits, loans and trusts to measure outputs in the banking industry, but there is a long-standing controversy in the literature on measuring output and productivity and on what should be included as inputs and outputs. Of particular interest is the issue of whether demand deposits should be considered as inputs or outputs to the bank production process. In his very interesting comment on the two banking papers, Frank C. Wykoff argues that the solutions to such issues are of fundamental importance if progress is to be made on measuring output and productivity in the banking sector. He identifies four different treatments of deposits that can be found in the literature. Deposits have been treated as inputs (by Sealey and Lindley, 1977), as outputs (by Berger and Humphrey) as both (by Triplett in his comments on the two papers) and as either (by Fixler and Zieschang). To this Wykoff suggests yet a fifth possibility; that they be treated as neither. On this issue I am strongly in Wykoff's camp. Wykoff argues that the transactions cost approach to analyzing markets could perhaps cast some light on the banking issue, and he identifies several areas in which markets are set up to facilitate intermediation. These include the stock market, retail stores, the market for doctors' services and the operations of shopping malls. Wykoff's focus

on intermediation is very much in the spirit of the discussion in section 2. One of the activities carried out by banks is the intermediation they provide between borrowers and lenders. Banks are institutions that exist because it is more efficient to bring together the two sides of the market in this way than to have potential borrowers seek out lenders individually. For borrowing and lending activities the output will be the dollar value of loans made and the price will be the interest margin between borrowers and lenders. Productivity improvements will imply a reduction in this margin. Of course, banks also provide a whole array of other services, but this does not distinguish banks from other service industries, or goods-producing industries for that matter.

The chapter by Dale W. Jorgenson and Barbara M. Fraumeni investigates ways of measuring the output of the education sector. They take the novel approach of defining the output of the educational system in a given year as the net addition to human capital that results from a student completing a year of education. The value of this output is derived by projecting the wage-education information into the future and then discounting the future value of output back to the present. Their approach employs a number of controversial assumptions. It assumes that differences in the wage structure are reflections of differences in human capital attributable to the education system. It assumes that current wages appropriately reflect future earning, and perhaps more importantly it considers leisure time to be an output of the education system that is valued at current wages. For example, it is assumed that all individuals spend 10 hours in sleeping, eating, and other maintenance activities, leaving 14 hours that are spent either working or on leisure. Hours worked are evaluated at the appropriate wage for that age and education group, and the hours of leisure are also assumed to provide output that is valued at the current wage rate. This last assumption is questioned by Michael Rothschild in his comments where he says "I doubt that within the audience at a football game (or an opera) the quality of the experience varies directly with the market wage." However, there would seem to be further difficulties with the Jorgenson and Fraumeni approach. Many young working couples with children would be surprised to learn that they individually enjoy some 58 hours of leisure a week (assuming a 40-hour work week) and that this leisure produces an output valued at their wage rate. Even more problematic are individuals who are unemployed, and who enjoy 14 hours of "leisure" a day. Indeed, in their measure of the value of total output, it makes no difference whatsoever whether or not a person works. An additional difficulty here is equating free time with leisure. As I have argued elsewhere (Melvin, 1974), the existence of free time does not guarantee that leisure can be produced. The useful conversion of free time into leisure typically requires education and an array of consumer durables.

Perhaps a more fundamental question is whether the Jorgenson-Fraumeni measure of output in education is the appropriate one, even if the difficulties identified above could be overcome. The education industry intermediates between people who have knowledge and people who do not. As with any other intermediation process, education would exist without an education industry, but it would be less efficient. The production of the output of the education industry is facilitated by the use of the factors of production required to provide this

intermediation service; a service that “consumers” are willing to pay for because it provides education more efficiently. While the calculation of the future benefits that will accrue to such education, both in terms of wages earned and leisure enjoyed, is interesting, it is not obvious that this is the appropriate measure of the output of the education industry.

The paper by Swati Mukerjee and Ann Dryden Witte considers the day-care industry and thus also deals, to some extent, with the issue of education. They focus on the construction of a quality-adjusted measure of output and settle on the number of hours of child care provided. To determine the output of the day-care industry one must determine what day-care does. On the one hand it can be seen as a kind of storage facility, or babysitting service, while on the other it can be seen as part of the education process. In fact it is probably both. Mukerjee and Witte emphasize the educational aspect and discuss ways of adjusting the output to take account of quality. While considerations of quality are important, it is not clear they are more relevant here than elsewhere. Just as it is possible to identify good and not-so-good day-care so is it possible to identify good and not-so-good hair cuts, or good and not-so-good hamburgers for that matter. In all cases, consumers choose among the alternatives on the basis of perceived quality and their preferences. Ideally, to measure the output of barbers one counts haircuts (or whatever), multiplies by price charged, and then sums. One does not make an adjustment to this output because some haircuts are perceived to be better than others. Quality differences, we assume, are reflected in price. Surely the same argument should apply to day-care. Quality differences are certainly important, but may not be as fundamental to the measurement of output in day-care as is suggested.

The chapter by Robert J. Gordon considers output and productivity in the transportation sector where he considers airlines, railways and trucking. He reviews the construction of output data and constructs multi-factor productivity indices for these industries. This is a carefully done paper which produces a number of interesting results, perhaps the most interesting being that deregulation of the transportation industry did not significantly increase productivity.

An interesting feature of the Gordon paper is his argument that improvements in the capital equipment of the transportation sector, improvements in fuel efficiency for trucks, for example, should not count towards productivity improvement in transportation, but should be allocated as improvements in the truck-manufacturing sector. In referring to time saved in air travel, he says “However, the invention of aviation, and the increased speed of aircraft from the beginning of the industry through the late 1960s, should be credited to the airframe and engine manufacturers rather than to the airline industry” (Gordon, p. 397). There would seem to be two issues here. The first is whether this is the correct approach to the treatment of technical change. I would have assumed that most technological change in transportation would be associated with improvements in the capital equipment of the industry. The transportation sector moves commodities from point A to B, and if it can move the same quantity of commodities at a lower cost surely this should be regarded as technological improvement, regardless of the source of this increase in efficiency. One could also ask whether this same argument should be used in the manufacturing sector. If the assembly

line for automobiles uses more efficient equipment, perhaps better robotics, and the outcome is a more efficient production process, would we not generally assume that there has been technological improvement in automobile production? Would we try to identify the precise equipment where the improvement occurred and attribute the productivity gain to the manufacturing of that capital equipment?

The second issue is how the attribution is to be done. A good deal of technological change is associated with the improvements in the capital equipment of the industry involved, and there will always be the question of how one attributes the "credit" for this improvement. But even if we decide to credit the improvements to the producers of the capital equipment, how can this be accomplished? If new cost-efficient trucks lower the cost of transporting commodities from A to B, how does this get credited to the motor vehicle industry? It will certainly not show up in our usual productivity measure for motor vehicles. A significant danger in excluding improvements in capital equipment for service industries in measures of productivity, is that these productivity improvements will not be captured anywhere.

6. OTHER SERVICE SECTOR ISSUES

One of the issues that has plagued measurement of output and productivity in the service sectors is the lack of reliable data. These problems are related to many of the issues we have discussed above and are associated with the fact that output in service sectors is often difficult to define and prices difficult to establish. Even if we agree on what the output of a service industry is, it is another matter to define an acceptable measure of output. Thus although we know what lawyers do, defining the unit of output of a law office and establishing a price for legal services is much different than establishing the output and prices of apples or oranges. Many of the issues concerning the difficulties in measurement of output and productivity are taken up in the first three chapters of the Griliches volume. Michael F. Mohr discusses recent and planned improvements in measurement and deflation of service industry output and inputs, while Edwin R. Dean and Kent Kunze discuss the issues associated with productivity measures. Improvements in measurements of price changes in consumer services is discussed by Armknecht and Ginsburg. A paper that addresses related issues is the one by Elizabeth Kremp and Jacques Mairesse. They examine productivity differences among firms in the same industry in the French economy. An interesting result is that there can be larger differences in productivity within an industry than there are between the average productivity levels for different industries. This will complicate productivity measurement, particularly given the high birth and death rates among service sector firms. These papers make a significant contribution to our knowledge of what is being done and emphasize the difficulties and complexities associated with these measurement issues.

One of the concerns in the study by the Economic Council of Canada is the quality of employment in the service sector. They are particularly concerned with the fact that many service sector jobs are low-paying and generally do not lead to advancement, a problem of particular importance, given the growth in employment in these sectors. A major conclusion reached by the ECC is that education will become increasingly important in a service-dominated economy, and they

No discussion of the problems associated with the service sector would be complete without some reference to the public sector. Richard Murray provides an analysis of the public sector in Sweden in which he makes a genuine attempt to measure output rather than just using inputs or throughput. Thus, for example, crimes solved are the output measure for the police service. An interesting conclusion from the Murray study is that in Sweden during the 1970s productivity in the public sector declined by 1.5 percent per year. He also calculates that the productivity decline accounts for approximately one-half of the large debt that was accumulated by the Swedish economy in that time period. In his introduction, Griliches notes that the results Murray derives for Sweden are quite different than those that have been produced for the U.S., where a 1.4 percent improvement in labor productivity in the Federal government has been calculated for the 1967–88 period. Griliches notes that differences in the output measures may account for some of this, but also adds “One may also question the veracity of the estimated . . . 1.2 percent per year improvement (from 1967–88) in the productivity of the U.S. postal service.” (Griliches, p. 19). The postal system is a delivery system very like transportation. The postal service intermediates information, in the form of letters, between individuals in different locations. The cost of providing this intermediation is reflected in the price of postage stamps. A rough check on whether productivity has improved in post office by 1.2 percent per year would be to determine whether or not the real price of stamps has fallen by 1.2 percent per year since 1967. In fact, the real price of postage, in 1982–84 dollars, rose marginally from \$0.120 to \$0.124 in that time period.

7. CONCLUSION

While service sector activities now make up some 70 percent of the economic activity of industrialized countries, economists have largely ignored services and they are still not in full agreement on how services should be defined nor on how output and productivity should be measured. The lack of attention paid to services would seem to stem largely from the fact that service activities deal with the things that are assumed away in traditional economic models, namely space, time and ignorance. In our theoretical models services do not appear because their *raison d'être* has been assumed away. In the real world, however, services are very much with us.

There would seem to be a real need to reformulate traditional economic models so that services can be incorporated in a meaningful way. The three books reviewed here make a major contribution to the ongoing debate, but it seems safe to say that all the issues have not yet been resolved. I have argued that for intermediation services such as transportation, retailing and banking, it is important to remember that it is the intermediation activity itself that is the output, with the price being the margin between suppliers and demanders. This is not the traditional approach to measuring output and price for services, nor is it clear that there is any practical way of implementing such a procedure. However, thinking about service output in this way may assist practitioners by helping them identify measures of output and price that are clearly not appropriate.

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