SERVICE SECTOR IN TODAY'S INFORMATION ECONOMY

Uday Apte, Cox School of Business, S.M.U, Dallas, TX, USA, uapte@mail.cox.smu.edu
Hiranya K Nath, Department of Economics, S.M.U, Dallas, TX, USA, hnath@post.smu.edu

ABSTRACT

This paper measures the size and structure of the U.S. information economy in 1992 and compares them with Marc Porat's measures for 1967[4]. It also examines the magnitude and growth of the information components of the service sector over the years. The results of this study highlight the importance of information in the U.S. economy. It also documents interesting facts about the growth and compositional changes of the information economy. The study indicates that the share of the information economy in total GNP grew from about 46 percent in 1967 to about 56 percent in 1992. It is interesting to note that while the share of service sector information activities in total GNP increased substantially the shares of non-service sectors declined. Finally this paper provides a critical evaluation of Porat's methodology and suggests a few improvements to obtain a more accurate measure of the size of the information economy.

INTRODUCTION

In advanced societies, information has come to play important roles in almost every walk of life. For example, consumer makes more informed decision now than before when she wants to buy, say, a car. Similarly, quick and ready access to information facilitates investor's decision on his portfolio. Producer can now easily make decision on what to produce, how to produce and for whom to produce. The unprecedented progress of information technology in last few decades has increased the intensity of information in almost every aspect of life. All encompassing pervasion of telecommunications and internet has changed the way of life: many a time physical labor has become minimal, movements have become unnecessary and life has become a lot easier. As a result, on the other hand, there has been tremendous growth of information related services. In brief, there has been profound and rapid structural change in developed economies as a result of the revolution in information technologies. 'Information increasingly holds key to growth, output and employment' [3], a role that was played by traditional factors of production such as land, labor and capital in the industrial society. Evolution of information as a commodity with an established market for it, and a vast network of communication and decision making now characterize the dynamics of growth in advanced economies. The all-pervasive impact of information revolution has important implications for the economy at macro level in terms of increasing share of information activities in national income. It is in this context that this paper intends to measure the size, structure and growth of the information economy in the U.S. This paper also looks into the size and growth of information components of the U.S. service sector.

In 1977, Marc Porat undertook an extensive study of information based activities in the U.S. economy. He provided precise definition of 'information activity' and elaborate discussion on various issues relating to it. Using data for 1967 he measured the size and structure of the U.S. information economy. Following Porat, in this paper we calculate GNP accrued to the information related activities in the U.S. in 1992. We examine in detail the contributions of

various sectors, particularly of the service sector, to the rapidly growing information activities. We observe that there has been substantial growth of the information economy over a period of 25 years. It is interesting to note that within the information economy the growth rate of the service sector is the highest.

The rest of the paper is organized as follows. The second section discusses the concepts and definitions. Database and methodology are discussed in section 3. The fourth section presents the measures of the size, structure and growth of the U.S. information economy in 1967 and in 1992. The fifth section includes a discussion on the growth of the information components of the service sector over a period of 25 years between 1967 and 1992. In the last section we provide a critical evaluation of Porat's methodology and a few concluding remarks.

CONCEPTS AND DEFINITIONS

In this paper we are using the concepts and definitions developed by Porat. He divided the economy into two distinct but inseparable domains: one 'is involved in the transformation of matter and energy from one form into another' and the other 'in transforming information from one pattern into another' [4]. The second domain is being referred to as information economy. The notion of information economy is embedded in two concepts: 'information' and 'information activity'. 'Information is data that have been organized and communicated. The information activity includes all the resources consumed in producing, processing and distributing information…' [4]. However the operational definition of information activity used in Porat's study encompasses 'all workers, machinery, goods and services that are employed in processing, manipulating and transmitting information' [4]. Porat divided the entire information economy into primary information sector and secondary information sector. The primary information sector is defined as one that includes all industries which produce goods and services which intrinsically convey information or are directly used in producing, processing or distributing information, for an established market. The secondary sector, on the other hand, 'includes all information services produced for internal consumption by government and non-information firms…. It includes the costs of organizing firms, maintaining and regulating markets, developing and transmitting prices, monitoring the firm's behavior and making and enforcing rules' [4]. Porat also developed a conceptual scheme for classifying information workers. This scheme divides occupations into three major classes. The first, 'Markets for Information', includes those workers whose output or primary activity is an information product, often in the form of a knowledge commodity. The second category includes information workers who search, coordinate, plan and process market information. In other words, they provide 'Information in Markets'. The third class is the 'Information Infrastructure' workers, whose occupations involve operating the information machines and technologies to support the previous two activities.

In order to measure the size of the information economy, various concepts of the national income accounting have been used. Because of space limitations we would not discuss them in detail. Size is measured in terms of contribution to GNP. At sectoral level we use the term 'value added' to represent GNP because they are equivalent concepts.

DATABASE AND METHODOLOGY

The main source of data for this study is 1992 Benchmark Input-Output (I-O) Tables. Other data sources include National Income and Product Accounts' (NIPA) 'Income, Employment and Product by Industry' detailed tables; Occupational Outlook Handbook, 1994-95; and Occupational Employment Statistics for 1992. The choice of 1992 as the year of our analysis is dictated by the fact that this is the latest year for which relevant data are available: the 1992 detailed I-O tables – which are prepared at 5-year intervals – were released only in 1997.

In order to measure the primary information sector, Porat identified 25 major 2-digit I-O industries (Input-Output [I-O] classification of industries is different from more familiar Standard Industrial Classification [SIC]) and included them in four broad categories of service, manufacturing, construction and government sector. Following Porat, we examine the mappings of 6-digit I-O industries within each of these 2-digit industries into 7-digit SIC products in order to identify the 6-digit information industries. Then we obtain value-added figures from 1992 Benchmark Detailed I-O use table for each of these 6-digit information industries. Aggregating over the 6-digit industries we obtain the information value added at corresponding 2-digit level. The definition of value-added Porat used for the secondary information sector is rather restrictive. According to this definition, value-added of a secondary information industry includes employee compensation of information workers, part of proprietors' income earned for performing informational tasks; and capital consumption allowances on information machines. To calculate employee compensation of information workers a matrix of occupation by industry is compiled from the Occupational Employment Statistics for 1992. Average/median salaries of information workers are obtained from the Occupational Outlook Handbook and then each entry in the above matrix is multiplied with the salary for the corresponding occupation to calculate the total employee compensation by industry. Data on proprietors' income and capital consumption allowances are obtained from NIPA's unpublished detailed tables and then the information shares calculated by Porat are applied to obtain proprietors' income and depreciation allowances accrued to the secondary information sector in 1992.

SIZE AND STRUCTURE OF THE INFORMATION ECONOMY

In 1992, 55.9 percent of the total U.S. GNP was generated in the information economy. About three-fifth of this came from the primary information sector and the rest was from the secondary information sector. As we see from Table 1 this share in the GNP has grown from 46.3 percent in 1967. Since during this period real GNP almost doubled this represents a tremendous growth of the information economy. It may be noted that most of this growth was accounted for by the growth in the primary information sector. The growth of the secondary information sector in terms of its share in total GNP was marginal.

Within the primary information sector, service sector accounted for more than two-third of its total value added. Information components of the service industries have grown from 14.85 percent of total GNP in 1967 to 22.6 percent in 1992 while manufacturing and construction sectors' shares have, in fact, declined as we can see from Table 1. There was a marginal increase in the share of the government sector.

Table 1
VALUE ADDED OF INFORMATION ECONOMY BY MAJOR INDUSTRIES: 1967 & 1992
(VALUES IN MILLIONS OF CURRENT DOLLARS)

YEAR/SECTOR→ INDUSTRY↓	1967			1992		
	Primary	**Secondary**	**Total**	**Primary**	**Secondary**	**Total**
Agriculture, Forestry, Fishing and Mining	0	1979 [0.25]	1979 [0.25]	0	16643 [0.27]	16643 [0.27]
Construction	8527 [1.07]	13243 [1.66]	21770 [2.73]	58752 [0.94]	72781 [1.17]	131533 [2.11]
Manufacturing	32691 [4.11]	57880 [7.28]	90571 [11.39]	229434 [3.68]	234393 [3.76]	463827 [7.44]
Service	118108 [14.85]	75719 [9.52]	193827 [24.37]	1408826 [22.60]	951088 [15.26]	2359914 [37.86]
Government	40699 [5.11]	18735 [2.36]	59434 [7.47]	358938 [5.76]	151046 [2.42]	509984 [8.18]
Rest of the World	0	517 [0.06]	517 [0.06]	0	1168 [0.02]	1168 [0.02]
Total [Information Eco]	200025 **[25.15]**	168073 **[21.13]**	**368098 [46.28]**	2055950 **[32.98]**	1427119 **[22.89]**	**3483069 [55.87]**
Total [All Industries] (GNP)			**795388 [100.00]**			**6233905 [100.00]**

Note: The figures in square brackets are the percentage shares in total value added by all industries (GNP)
Source: 1] Reference (4)
2] Authors' Calculation.

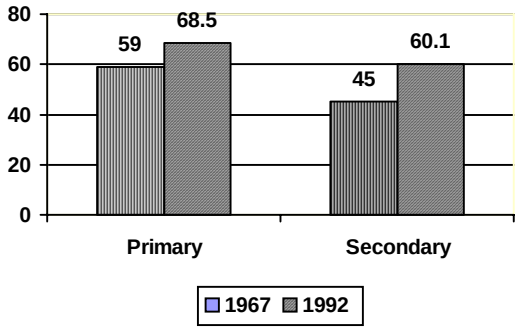
Even within the secondary information sector, service industries have the highest share and in fact it rose from 9.52 percent in total GNP in 1967 to 15.26 percent in 1992. The shares of construction and manufacturing industries, on the other hand, declined during this period. There were marginal changes in the shares of other sectors.

From this table we observe three important facts about the size, structure and growth of the US information economy. First, more than half of total GNP in 1992 was generated by information related activities. Second, growth of the primary information sector was much higher than that of the secondary sector. Finally, the information components of the service sector have increased by leaps and bounds.

SIZE AND GROWTH OF INFORMATION COMPONENTS IN SERVICE SECTOR

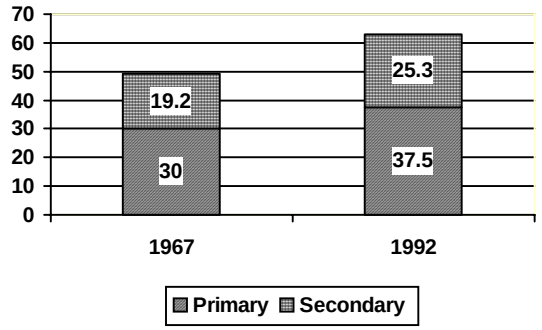
Now we will look more closely into the service sector. As we can see from Exhibit 1, the shares the service industries in both primary and secondary information sector increased substantially over the years. We observe that the share of service industries was 59 percent of total GNP generated in the primary information sector in 1967 and it rose to 68.5 percent in 1992. Similarly their share in the secondary information sector increased from 45 percent in 1967 to 60.1 percent in 1992. A part of these increases can be ascribed to the growth of the information components of the service industries. The shares of information components in service industries,

decomposed into primary and secondary, in 1967 and in 1992 are shown in Exhibit 2. As we can see, the information components of service industries in the primary information sector increased



%SHARES OF SERVICE INDUSTRIES IN PRIMARY AND SECONDARY INFO SECTOR

Exhibit 1



% SHARES OF INFO COMP WITHIN SERVICE SECTOR

Exhibit 2

in their share from 30.0 percent of total GNP of the service sector to 37.5 percent and in the secondary information sector from 19.2 percent to 25.3 percent. The growth of the service industries in the primary information sector, and the fact that the shares of non-service industries in the secondary information sector have mostly declined reinforce our argument that non-service firms increasingly rely on the primary sector for the supply of information services. as it is observed elsewhere, higher growth of the primary information sector compared to that of the secondary information sector indicates that firms increasingly 'contract out information activities' and reduce their in-house production 'by relying more and more on the primary information sector or marketed information services' [1].

Table 2 shows information value added of major service industries at more detailed levels in 1967 and in 1992 with a decomposition of primary and secondary information sector components. During this period business services and medical, educational and nonprofit organizations have grown substantially in their shares in the information value added of the service sector. On the other hand, shares of transportation, communications and trade services fell considerably during the same period. The changes in the shares of other service industries were marginal.

Table 2
INFORMATION VALUE ADDED OF SERVICES BY MAJOR INDUSTRIES: 1967 & 1992
(VALUES IN MILLIONS OF CURRENT DOLLARS)

YEAR/SECTOR→ INDUSTRY↓	1967			1992		
	Primary	**Secondary**	**Total**	**Primary**	**Secondary**	**Total**
Transportation	0	8115 [4.19]	8115 [4.19]	0	53038 [2.25]	53038 [2.25]
Communications	17609 [9.08]	0	17609 [9.08]	132370 [5.61]	0	132370 [5.61]
Electricity, Gas and Sanitary Services	0	2612 [1.35]	2612 [1.35]	0	20602 [0.87]	20602 [0.87]
Wholesale and Retail Trade	16053 [8.28]	42447 [21.90]	58500 [30.18]	115462 [4.89]	446004 [18.90]	561466 [23.79]

Finance and Insurance	26031 [13.43]	3341 [1.72]	29372 [15.15]	341571 [14.47]	3907 [0.16]	345478 [14.64]
Real Estate and Rental	15392 [7.94]		15392 [7.94]	153516 [6.51]	4595 [0.19]	158111 [6.70]
Hotels, Personal repair services except auto	853 [0.44]	3740 [1.93]	[2.37]	1389 [0.06]	37757 [1.60]	[1.66]
Business services	22878 [11.80]	6535 [3.37]	[15.17]	463925 [19.66]	169185 [7.17]	[26.83]
Amusements	2009 [1.04]	780 [0.40]	[1.44]	25669 [1.09]	18364 [0.78]	[1.87]
Medical, Education & Non-profit organization	17615 [9.09]	6773 [3.49]	[12.58]	174924 [7.41]	182516 [7.73]	[15.15]
Other Services	0	1376 [0.71]	1376 [0.71]	0	15120 [0.64]	15120 [0.64]
Total [All Services]	118108 [60.93]	75719 [39.07]	**193827 [100.00]**	1408826 [59.70]	951088 [40.30]	**2359914 [100.00]**

Note: The figures in square brackets are the percentage shares in total information value added of the service sector

Source:1] Reference (4)

2] Authors' Calculation.

CONCLUSION

Porat's methodology tends to overestimate the size of the information economy. 'The failure to exclude the non-information activities' in the primary information sector industries leads to 'an element of overstatement' [2]. Also 'the methodology suffers from limitations imposed by the static and linearity assumptions that underpin the Leontief input-output methods' [1]. However in order to get rid of the element of overestimation we would propose that the employee compensation of information workers, part of proprietors' income earned for performing informational tasks; and capital consumption allowances on information machines in the primary sector be calculated to measure its value added. As we discussed in the beginning, there have emerged new information services to cater to the needs of the society which increasingly use more and more information. To capture this phenomenon we need to study newly emerged as well as old information services more carefully and in more detail.

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