

# **THE CONTRIBUTION OF THE INFORMATION SECTOR TO GNP: THEORY AND A COMPARATIVE ANALYSIS FOR TURKEY\***

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## **ABSTRACT**

Advanced countries, especially the US and Japan, have transformed from industrial society to the information society since 1950s. In this new society, information and knowledge have been important for innovation and policy formulation. As a result, information and knowledge<sup>1</sup> production activities in the advanced countries have increased. These developments have led to the quantification of information production in the information societies.

This article aims to analyse the studies related with the measurement of the share of the information sector in GNP. Additionally, it aims to analyse the size of the information related activities in Turkey in comparison with other countries. The comparisons for Turkey have indicated that the contribution of the information related activities to GNP in Turkey was lower than that of the other countries.

## **I.) INTRODUCTION**

One of the most widely discussed topic in the social development literature has been the transformation of the industrial society into the information society since early 1950s. The information society is referred to under different names and characterized by the increasing role of information and knowledge in the society. In this new society, the economy shifts from a good producing sector to a service and information based economy. Research and development activities have an important share in total employment and production. Computer technology, information technology (IT) and more recently information and communication technologies (ICTs) replace the "mental labour of men" (Masuda, 1981). These changes in the advanced societies have led to the emergence of a white-collar workforce (scientists, technicians and managers) as the dominant class replacing the blue collar workers.

As theoretical knowledge has become the central variable of the information society, universities and other research institutions have become the "axial structures" of the society (Bell, 1973, p.26; Crawford, 1991, p.34). As a result, knowledge production have also increased in developed countries. There are two important indicators of the knowledge production activities that go with the information society: (i) the share of the research and development expenditures in GNP, and (ii) the share of the educational expenditure in GNP. In 1993, research and development expenditures comprised 2.9% of GNP in the US, and 3% of GNP in Japan. In the same year, educational expenditure had a larger share in GNP, 5.3% in the US and 4.7% in Japan (UNESCO, 1995).

The increasing knowledge production activities in the countries, especially in the information societies, have led to the quantification of information and knowledge production in the economy. The literature review has indicated that most of the studies that quantify the proportion of information related activities in GNP have been performed for developed countries such as the US, Japan and some European countries. It is clear that there is not any study that analyse the contribution of the information related activities to GNP in Turkey. So, this study will be important as it will show the size of the information related activities in Turkey comparatively with the other countries.

This article has two purposes. Firstly, it will summarise the studies that quantify the information production in various countries to give an idea about the literature. Secondly, it will show the extent to which the contribution of the information related activities to GNP in Turkey.

This paper is divided into four parts. After the introductory section, section two reviews the studies that analysed the share of the information related activities in GNP. The third section explains the indicators used in this paper and makes comparisons for Turkey. The final section summarises the conclusions.

## **II.) THE CONTRIBUTION OF THE INFORMATION SECTOR TO GNP**

Some of the studies in the information society literature are concentrated on the share of the information sector in GNP. The approaches and the results of these studies will be summarized so that we can have an idea about the earlier studies.

## A.) THE INFORMATION SECTOR IN THE UNITED STATES

Machlup (1962) was the first economist who measured the size of the knowledge production in the US economy. He measured knowledge production in the US by redefining GNP in order to have a new conceptual framework in which the role of information could be highlighted. In Machlup's analysis, knowledge industry consists of five groups of activities: (i) education, (ii) research and development, (iii) media of communication, (iv) information machines, and (v) information services.

**Table 1: Total Knowledge Production in the US (1958)-Millions of dollars-**

Industry	Total value	Percentage of total	Percentage of GNP
-Education	60,194	44.1	12.6
-Research and development	10,990	8.1	2.3
-Media of communication	38,369	28.1	8.0
-Information machines	8,922	6.5	1.9
-Information services	17,961	13.2	3.8
Total knowledge production	136,436	100.0	28.5
Total 1958 GNP	478,900		

Source: Adapted from F. Machlup. (1962). *The Production and Distribution of Knowledge in the United States*. Princeton, NJ: Princeton University Press, pp. 354-357.

Table 1 summarizes Machlup's estimates of the size of the knowledge industry. As we can see from Table 1, knowledge industries accounted for 28.5% of the GNP, with an important share of that in education (44.1%) and media of communication industries (28.1%) in 1958.

**Table 2: Knowledge Production in the US (1958-1980)-As % of GNP-**

Categories	1958	1963	1967	1972	1977	1980
Education	11.8	13.3	14.7	14.8	13.7	12.5
Research and development	2.2	2.6	2.6	2.2	2.1	2.2
Media of Communication	7.7	7.5	7.7	7.9	8.1	8.0
Information machines	2.0	2.4	2.6	2.3	2.7	3.2
Information Services	4.9	5.2	5.7	6.7	7.6	8.4
Total	28.6	31.0	33.3	33.9	34.2	34.3

Source: Rubin, M.R. and Huber, M.T. (1986). *The Knowledge Industry in the United States 1960-1980*. Princeton, NJ: Princeton University, p.19.

Machlup's approach was used in another research to measure the size of the knowledge industry in the US between 1960 and 1980 (Rubin and Huber, 1986). Their calculations indicated that the share of the knowledge industry in GNP increased from 28.6% in 1958 to 34.3% in 1980 (see Table 2).

Table 2 presents the change in the share of the knowledge production in the US between 1958 and 1980 as well as the change in the proportion of related activities that constitute knowledge production. It is observed from Table 2 that the share of the knowledge production increased from 11.8% in 1958 to 14.8% in 1972. But, the share of education has declined since 1972. It should be pointed that education had the largest share (12.5 %) in total knowledge production in 1980. The proportion of GNP spent on research and development in the US has not changed too much in the same period. Another category that had a stable proportion in GNP is media of communication, which had an increase from 7.7% in 1958 to 8% in 1980. When Table 2 is observed, it is clear that the largest increase in the share of information services (71 %) during the period. This means that more information services were demanded in the US as this country transformed to information society.

In contrast to Machlup, Porat made a distinction between the "primary information sector" and the "secondary information sector" of the economy. "The primary information sector includes those firms which supply the bundle of information goods and services exchanged in a market context.... The secondary information sector includes all information services for internal consumption by government and non-information firms" (Poirier, 1990, p.250).

To determine the scope of the primary information sector, Porat used the list of the industries and products arranged by Standard Industrial Classification (SIC) number. The primary information sector includes eight groups (Table 3).

**Table :3 Primary Information Sector**

<b>Main Groups</b>	<b>Sub-groups</b>
Knowledge production and inventive industries	-Research and development industries -Private information services
Information distribution and communication industries	-Education -Public information services -Regulated communication media -Unregulated communication media
Risk management	-Insurance industries -Finance industries -Speculative brokers
Search and coordination industries	-Search and non-speculative industries -Advertising industries -Non-market coordinating institutions
Information processing and transmission services	-Non-electronic based processing -Electronic based processing -Telecommunication infrastructure
Information goods industries	-Non-electronic consumption or intermediate goods -Non-electronic investment goods -Electronic consumption or intermediate goods -Electronic investment goods
Selected government activities	-Primary information services in the Federal government -Postal service -State and local education
Support Facilities	-Information infrastructure construction and rental -Office furnishing

Source: Cooper, M.D. (1983). "The Structure and the Future of the Information Economy", *Information Processing and Management*, (19), 1, p. 16.

Porat calculated the contribution of the primary information sector to GNP in 1967 in terms of both value added and final demand<sup>2</sup>. His calculations indicated that the share of the primary information sector in GNP was 21.9% when final demand was used (see

Table 4) and 26.9% when value added was used (see Table 5). Table 4 also shows that 17.1% of consumer expenditures, 17.9% of gross private domestic investment and 36.8% government expenditures were spent on information. Similarly, Table 5 shows that 28.9% of employee compensation, 15.1% of proprietors' income and 42.5% of corporate profits were contributed by information activities.

**Table 4: The Share of the Primary Information Sector in GNP (1967) -Millions of dollars-**

GNP	Total final demand	Information final Demand	Information percent of total
-Gross National Product	795, 388	174, 585	21.9
-Personal consumption expenditures	490, 358	83, 742	17.1
-Gross private domestic investment	120, 829	21, 583	17.9
-Net export of goods and services	4, 937	2, 942	59.6
-Government purchases of goods and services	180, 188	66, 308	36.8
-Statistical adjustment	-924		

Source: M. D. Cooper. (1983). "The Structure and the Future of the Information Economy", *Information Processing and Management*, (19), 1, p.18.

Rubin and Taylor used Porat's methodology and calculated information value added in the US for 1972. According to their calculations, the share of the primary information sector in GNP declined to 24.8% in 1972 from 25.1% in 1967 (Rubin and Taylor, 1981, p.165).

**Table 5: The Contribution of the Information Sector to National Income by Type of Income (1967)-Millions of dollars-**

Type of Income	Total national income	Information national income	Information percent of total
<b>National income</b>	<b>655, 805</b>	<b>176,319</b>	<b>26.9</b>
-Compensation of employees	471,915	136,488	28.9
-Proprietors' income	60,974	9,187	15.1
-Rental income of Persons with capital consumption adjustments	19,376	0	0
-Corporate profits and inventory valuation adjustment	79,261	33,675	42.5
-Net interest	24,279	-3,031	

Source: M. D. Cooper. (1983). "The Structure and the Future of the Information Economy" *Information Processing and Management*, (19), 1, p.18.

Porat also estimated the share of the secondary information sector in GNP. In 1967, the secondary information sector comprised 21.1% of GNP in the US. In 1974, the share of the secondary information sector in GNP increased to nearly 25.5% and the share of the primary information sector to 29% (Bell, 1982, p.522).

Another author who showed the extent of information related activities in the US economy was Bell. Differently from Machlup and Porat, he did not calculate total information production in the US economy. He just used some indicators such as educational expenditure, research and development expenditures to show the size of information sector in the US.

### **B.) The Information Sector in Other Countries**

OECD also measured the contribution of the information sector to national accounts of member countries, which provide statistical data. Based on the work of Porat (1977), they divided the information sector into two parts which are "primary" and "secondary". After classifying information goods and services, they calculated the contribution of the information goods and services to GDP<sup>3</sup> at factor cost, using the value added method.

Table 6 presents their results (in percentages) for a number of countries for specific years. France and the US had nearly similar primary information sector share in their GDP. The UK followed these countries (22%) in 1972. Although the data for Japan (1970) and Sweden (1975) are for different years, these countries had similar primary information sector shares in their GDP. The data for Australia is only available for 1968. When we compare this data (14.6%) with that of the other countries, France had a higher share (22.8%) than Australia in 1968. In 1967, the US (23.8%) had a more higher primary information sector share than Australia. These observations indicate that more developed countries such as the US, the UK and France had higher primary information sector shares in their GDP. These observations also indicate that information goods and services in these three countries are generally provided from the firms which supply the bundle of information goods and services exchanged in a market context.

**Table 6: The Contribution of the Primary Information Sector to GDP in OECD Member Countries (1958-1975) -% of GDP at factor costs-**

Australia	France	Japan	Sweden	United Kingdom	United States
(1968) 14.6	(1962) 21.6 (1968) 22.8 (1973) 24.8	(1960) 8.4 (1965) 14.8 (1970) 18.8	(1970) 16.9 (1975) 17.8	(1963) 16.0 (1972) 22.0	(1958) 19.6 (1967) 23.8 (1972) 24.8

Source: OECD. (1981). *Information Activities, Electronics and Telecommunication Technologies*. Vol. II. Paris: OECD, p. 28.

OECD also calculated the share of the secondary information sector in GDP. This sector incorporates information services produced for internal consumption within that part of the public sector and private enterprise which does not belong to the primary information sector (OECD, 1986, p.26).

**Table 7: The Contribution of the Secondary Information Sector to GDP in the US, Japan and the UK (1958-1972) -Percentage and at factor costs-**

Japan	United Kingdom	United States
(1965) 21.8 (1970) 16.2	(1963) 13.8 (1972) 10.9	(1958) 23.1 (1967) 24.7 (1974) 24.4

Source: OECD. (1981). *Information Activities, Electronics and Telecommunication Technologies*. Vol. II. Paris: OECD, p. 33.

Table 7 presents their results, showing that the share of the value added contributed by non-information activities fell over the time period. This means that information products and services are increasingly purchased on established markets because the share of the primary information sector increased in these countries.

OECD's work was the first study that allowed international comparisons of the information sectors. Although this feature distinguishes their study from the earlier studies that measured the information economy, their data collection method limits the comparability of the size of the information sector to these countries. Furthermore, as the data utilized in OECD study is based on the member country data sources, the information industries defined by OECD also differed according to the definitions in member country data sources.

More recently, Dordick and Wang (1993) showed the trends of the information society indicators in some developed and developing countries. However, they did not



follow an approach applied by Machlup, Porat and OECD. Instead, they used some parameters, such as GNP per information workforce and employment in the information sector, to show the size of information sector.

As a result, this section has reviewed the literature related with the quantification of information production. The approaches utilised to determine the share of the information sector in GNP can be divided into two groups. The approaches in the first group are based on disaggregated data. It is possible to calculate the total share of the information production in GNP when the disaggregated approaches are used.

The approaches in the second group are not based on disaggregated data. Although it is not possible to calculate the total share of the information sector by using these approaches, they can be used when the detailed data are not available.

### **III.) THE CONTRIBUTION OF THE INFORMATION RELATED ACTIVITIES TO GNP IN TURKEY: A COMPARISON WITH OTHER COUNTRIES**

This section shows the contribution of the information related activities to GNP in Turkey comparatively with some developed and developing countries. The contribution of the information sector to GNP will not be measured by using a disaggregated approach applied by Porat and OECD as the detailed data are not available for Turkey. So, the contribution of the information sector to GNP in Turkey will be analysed by using some indicators that represent information related activities. This approach was used by Bell (1973), Dordick and Wang (1993), and Atik and Tanna (1997) to show the extent to which the production of information has increased in various countries.

Three indicators are used to measure the contribution of the information sector to GNP in this paper. These are:

- The share of educational expenditure in GNP,
- The share of research and development expenditures in GNP,
- The share of information, communications and technology (ICT) expenditures in GNP.

The reason why these indicators are used and the comparisons between the countries, especially the comparisons for Turkey, will be explained in the next section.

### **A.)Educational Expenditure in GNP**

Education has different roles in industrial and information societies. In an industrial society, the main role of education is to decrease illiteracy and to provide technical training. In this sense, as Crawford (1991) argues, education is only available for a limited time period in an industrial society. In an information society, however, education has lifelong learning role. As information and knowledge are critical in the information society for innovation and policy formulation, education has become a permanent activity. As a result, the level of education and educational expenditures have been increasing in advanced societies.

Educational expenditures or investment in human capital has exceeded investment in physical capital in most countries. As Crawford (1991) argues, "this change can be observed from the US investments in human capital. In 1987, approximately \$610 billion were invested in human capital and \$440 billion in physical capital. Human capital investment was composed of \$310 billion in direct annual expenditures on all forms of formal schooling (public and private primary, secondary and higher education, and vocational training); \$100 billion in worker training by employers (exclusive of informal efforts to improve skills and performance on the job); and \$200 billion in foregone wages of students age sixteen and over"(Crawford, 1991, p.30).

It is clear from the earlier explanations that one of the most important indicator that shows the contribution of the information sector to GNP is the share of the educational expenditure in GNP. This indicator was used by Machlup(1962), Bell(1973), Rubin and Huber(1986), and Atik and Tanna (1997) to calculate the contribution of the knowledge industry (information sector) to GNP.

Educational expenditure in percentage of GNP for Turkey is given in Table 8 comparatively with the other countries. There are wide disparities in the share of GNP spent on education between the countries in Table 8; for example, in 1992, the share of GNP spent on education was 3.1 % in both Korea and Greece, and was 7.8 % in Netherlands. In the same year, the share of educational expenditure in Turkey was 3.8 %. This proportion shows that Turkey had the second lowest share after Korea and Greece (3.1 %).

**Table 8: Educational Expenditure in Turkey and Other Countries(1992) -Percentage -**

Countries	% of GNP
Netherlands	7.8
The US	6.7
Hungary	6.6
Belgium	6.2
France	5.7
Avusturya	5.6
Italy	5.4
Japan	5.0
Portugal	5.0
The UK	4.7
Spain	4.6
Turkey	3.8
Greece	3.1
Korea	3.1

Source: OECD. (1995). *Education At a Glance*.

Paris: OECD; UNESCO.(1995). *Statistical Yearbook*.

Paris: UNESCO.

There can be two reasons of this low proportion in Turkey. Firstly, Turkey cannot spend on education as much as the other developed countries because she does not have enough funds. It is not only the problem of Turkey, but it is also the problem of other developing economies, such as Korea and Greece in Table 8.

Secondly, the amount of money spent on education in Turkey could have been decreased in recent years. Table 9 is arranged to show whether this argument is true. Table 9 shows that the share of educational expenditure in the budget declined between 1983 and 1988. Then, it started to increase after 1988. This means that the reason of low GNP share in 1992 cannot be the cut in educational expenditure in Turkish budget as the share of educational expenditure in total budget increased from 17.3 % in 1991 to 19.7% in 1992.

**Table 9 Educational Expenditures in Consolidated Budget in Turkey (1983-1992) -Percentage-**

Years	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Shares in Total Budget	13.1	12.6	12.5	11.6	12.3	12.4	15.5	18.8	17.3	19.7

Source: State Planning Organization. (December 1997). *Economic and Social Indicators (1950-1988)*. Ankara: State Planning Organization, p.162, Table 8-15.

In conclusion, the first argument that Turkey cannot spend on education as much as the other advanced economies is more acceptable. As Turkey transforms to information society, the amount of money spent on education will increase. So, the share of educational expenditure in GNP will go up.

#### **B.) Research and Development Expenditures in GNP**

Research and development activities are increasing in advanced societies. The size of these activities is generally measured by the number of researchers in the total population and the percentage of research and development expenditures in GNP. It is noted earlier that research and development expenditures represent a proportion of the expenditure devoted to knowledge production together with the educational expenditure. After the end of World War II, the US increased expenditure on these activities and devoted nearly 3% of the GNP. In 1963-64, 3.4% of GNP was spent in the US, while this percentage was 2.3% in the UK, 1.4% in Germany and 1.5% in Japan. The percentage of GNP (3%) devoted to research and development by the US was accepted as a target by other developed countries (Bell, 1973, pp.250-251).

**Table 10: Research and Development Expenditures in Turkey, Other Countries, and Country Groups (1993) -Percentage-**

Countries	Research and Development Expenditures in GNP
Sweden	3.1
The US	2.8
North America	2.5
Germany	2.5
France	2.4
OECD Countries	2.3
European Community	1.9
Czech Republic	1.8 <sup>a</sup>
Austria	1.6
Canada	1.5
Hungary	1.1 <sup>a</sup>
Spain	0.9
Poland	0.9 <sup>a</sup>
Chile	0.7 <sup>a</sup>
Romania	0.7 <sup>a</sup>
Turkey	0.5
Venezuela	0.5 <sup>a</sup>
China	0.5 <sup>a</sup>
Argentina	0.3 <sup>a</sup>
Costa Rica	0.3
Cyprus	0.2 <sup>a</sup>

Notes: (a) The data is for 1992.

Source: OECD. (1995). *Main Science and Technology Indicators 1995/1*. Paris: OECD and UNESCO. (1995). *Statistical Yearbook*.

Table 10 presents the proportion of research and development expenditures in Turkey and other countries. In 1993, Cyprus (0.2 %) had the lowest share, while Sweden had the highest proportion (3.1 %). It is observed that advanced countries in Table 10 spend more than 2% of their GNP on research and development. However, most of the countries, except Sweden, could not reach the target (3 %) in 1993.

In the same year, Turkey devoted 0.5% of its GNP to research and development activities. When we compare this proportion with the other countries, it is similar to that of the other developing economies in Table 10. Turkey had the same percentage with Venezuela and China in 1993. Although this proportion (0.5%) is very low in comparison with that of Sweden (3.1%), it is higher than the other shares, which Argentina (0.3%), Costa Rica (0.3%) and Cyprus (0.2%) had in 1993.

These observations indicate that Turkey does not spend enough on research and development activities comparatively with advanced economies. However, this is also the case for other developing countries in Table 10. This is because, Turkey as well as the other less developed countries do not have sufficient sources for these activities. Instead of producing new technologies and products, the import of these elements is more profitable for developing economies. As Turkey and other developing nations concentrate on producing high technology products, the share of research and development expenditures in GNP will increase.

### **C.) Information, Communication and Technology (ICT) Expenditures in GNP**

Information technology has been an important aspect of the information society. The term ICT has more recently been coined in the literature to reflect the developments in information technology (IT) and communications. It is believed that the share of ICT expenditures in GDP represents some of the indicators (media of communication, information machines and information services) in Machlup's work, and some industries (information distribution and communication industries, information goods industries, information processing and transmission services) in Porat's work (Atik and Tanna, 1997, p.5). The diffusion of ICT in Turkey as well as in other countries will be highlighted in terms of the share of ICT expenditures in GDP.

**Table 11: ICT Expenditures in Turkey and Other Countries (1992-1995)**  
-Percentage-

Countries	ICT Expenditures in GNP			
	1992	1993	1994	1995
Austria	3.52	3.88	3.92	3.94
Belgium/Luxembourg	3.99	4.36	4.26	4.37
Denmark	4.24	4.67	4.64	4.71
Finland	3.65	4.91	4.50	4.50
France	3.82	4.19	4.21	4.32
Germany	4.21	4.49	4.48	4.61
Greece	2.75	3.35	3.65	3.59
Ireland	4.26	4.80	4.63	4.56
Italy	2.48	3.13	3.21	3.18
Netherlands	4.64	5.02	4.99	5.32
Norway	4.63	5.45	5.53	5.47
Portugal	3.19	4.06	4.36	4.50
Spain	2.40	2.88	3.13	3.15
Switzerland	5.69	6.03	5.86	6.13
Turkey	2.60	2.80	3.00	3.10
UK	4.52	5.23	5.23	5.32
US	5.65	5.63	5.63	5.71
Japan	4.15	3.62	3.49	3.66

Source: Data for Turkey are obtained from European Commission Office DG III-Industry; Data for other countries are from European Economic Interest Grouping. (1996). *European Information Technology Observatory 96*. Frankfurt/Main: European Economic Interest Grouping, p.332, Table 100.

Table 11 shows the proportion of GNP spent on ICT expenditures in some European Countries, Turkey, the US and Japan. It should be noted that Table 11 does not contain any data for developing countries as we could not find any publications with such data. So, the data for Turkey should only be compared with that of the advanced countries and with that of the less developed European countries such as Greece, Italy and Portugal.

Table 11 presents that the share of ICT expenditures in GNP changed between 2.40 % (Spain) and 5.69% (Switzerland) in 1992. When we look at the data for 1995, it is clear that this proportion changed between 3.10% (Turkey) and 6.13% (Switzerland) in 1995. The change in the proportion of ICT expenditures between these two years indicates that the percentage of these expenditures in GNP is increasing. However, there is always wide differences in the share of this expenditures between advanced and developing countries in Table 11.

As was stressed earlier, this indicator for Turkey is compared only with the European countries, the US and Japan as a result of the lack of data for other developing countries. If we find data for some developing countries, perhaps, Turkey will not be the only country with lowest share. However, the share of ICT expenditures in Turkey is similar to some European Union countries, such as Italy (3.18 %) and Spain (3.15 %).

Another important point observed from Table 11 for 1992 is that the proportion of GNP spent on ICT activities in Japan (3.66 %) is not too high, when the proportion for Turkey (3.10 %) is considered. Of course, this does not mean that Turkey and Japan are in the same development level in terms of the information society. The reason for this similar shares can be explained in connection with the development level of countries towards the information society. Japan was one of the advanced countries in the world that transform from industrial society to the information society in early 1960s. Which means that Japan has already finished important ICT investments so far. As a result, the share of ICT expenditures in Japan, which can only contain current expenditures, is smaller than the other countries. But, it is impossible to say that Turkey has also completed necessary investments on ICT.

To summarise, it is obvious that information related activities had lower shares in Turkey. Although the data for indicators are for different years, we can sum the share of all three information related activities. Then, the result is 7.4 % (3.1%, 3.8, 0.05%). If this is compared with the results of Machlup (28.5%)-although the methodology is different- it is clear that the contribution of information related activities to GNP in Turkey is very low.

#### **IV.) CONCLUDING REMARKS**

This article has dealt with various approaches used in the analysis and measurement of the information (knowledge) production. It has also dealt with the comparisons for Turkey. Machlup, Porat and OECD calculated the share of the total information sector in GNP, while Bell, Dordick and Wang, and Atik and Tanna only showed the contribution of some information related activities to GNP. Although most of the studies reviewed here have built up on Machlup's or Porat's work, the differences in the definitions of information industry make cross-country comparisons difficult. The overall finding related with the literature is that, no matter which approach is applied, the information production has increased in recent years.



The contribution of information sector to GNP in Turkey could not be measured by using a disaggregated approach applied by Machlup, Porat and OECD since the necessary data were not available. Following Bell and the others, the share of some information related activities in GNP compared with that of the other countries. Three indicators, educational expenditure, research and development expenditures and ICT expenditures, used to indicate the contribution of information related activities to GNP in Turkey.

The data indicated that Turkey did not have the lowest shares comparatively with the countries in tables. But, Turkey had similar shares with some European countries and developing economies. This showed that information production in Turkey was not enough when it was compared with that of the advanced countries. It is clear that the share of information related activities in GNP will increase in Turkey as Turkey devotes more funds for information production.

#### **ENDNOTES**

\* Theoretical part of this paper is based on my Ph.D thesis entitled "Sanayi-Sonrası Toplum Sürecinde Avrupa Birliği", Erciyes Üniversitesi Sosyal Bilimler Enstitüsü, Kayseri, 1996.

<sup>1</sup> Although information and knowledge are sometimes accepted in the same sense, knowledge has a wider meaning. "Information" means "data". But, "knowledge" means information processed into some useful form (Martin, 1988).

<sup>2</sup> Final demand is the sum of personal consumption expenditures, gross private domestic investment, exports and government purchases of goods and services, whereas value added is the sum of compensation of employees, proprietors income, corporate profits, and interests (Cooper, 1983, p.17).

<sup>3</sup> Although earlier scholars measured the share of knowledge or information production in GNP, OECD study group calculated the share of information production in GDP.

#### **REFERENCES**

Atik, H. (1996)."Sanayi-Sonrası Toplum Sürecinde Avrupa Birliği", (Yayınlanmamış Doktora Tezi), Kayseri: Erciyes Üniversitesi Sosyal Bilimler Enstitüsü.

- Atik, H. and Tanna, S. (1997). "Informatisation in the EU: An Empirical Analysis", Paper Presented to *METU Conference on Economics*. Ankara: METU.
- Bell, D. (1973). *The Coming of Post-Industrial Society: A Venture in Social Forecasting*. New York: Penguin Books.
- Cooper, M. D. (1983). "The Structure and Future of the Information Economy", *Information Processing and Management*, 19, 1, pp.9-26.
- Crawford, R. (1991). *In the Era of Human Capital*. New York: Harper Collins.
- Dordick, H. S. and Wang, G. (1993). *The Information Society: A Retrospective View*. California: Sage Publication.
- European Economic Interest Grouping. (1996). *European Information Technology Observatory 1996*. Frankfurt/Main: European Economic Interest Grouping.
- Machlup, F. (1962). *The Production and Distribution of the Knowledge in the United States*. Princeton, NJ: Princeton University Press.
- Masuda, Y. (1981). *The Information Society: As Post-industrial Society*. Bethesda: World Future Society.
- OECD. (1981). *Information Activities, Electronics and Telecommunication Technologies*. Paris: OECD.
- OECD. (1986). *Trends in the Information Economy*. Paris: OECD.
- OECD. (1995). *Main Science and Technology Indicators 1995/1*. Paris: OECD.
- OECD. (1995). *Education At a Glance*. Paris: OECD.
- Poirier, R. (1990). "The Information Economy Approach: Characteristics, Limitations, and future Prospects", *The Information Society*, 7, pp.245-285.
- Porat, M. U. (1977). *The Information Economy: Definition and Management*. US Department of Commerce.
- Rubin M. R. and Huber, M. T. (1986). *The Knowledge Industry in the United States 1960-1980*. Princeton, NJ: Princeton University Press.
- State Planning Organization. (December 1997). *Economic and Social Indicators (1950-1988)*. Ankara: State Planning Organization.
- UNESCO. (1995). *Statistical Yearbook 1995*. Paris: UNESCO.