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**Abstract**

The impact of Information and Communication Technology (ICT) on economic growth and development has nowadays proven to be significant for almost all national economies. In this paper the quantitative analysis confirmed its significance by using the input-output (IO) method. The direct and indirect effects of the ICT sectors are analysed, simple output multipliers and simple value added multipliers are calculated. The ICT multipliers for Croatian economy in 2010, when compared to the multipliers for other sectors, do not show any significant differences. The greatest values of multipliers of all ICT sectors has one of the service ICT sector. After comparing the ICT multipliers for Croatian economy in 2004 and 2010, significant changes are also not observed. In addition to Croatia, multiplier analysis of the ICT sectors has been achieved for the group of European Union (EU) new and long-standing member states. It is concluded that, in new member states, the implementation and usage of the ICT has lower contribution to their economic growth and development.

**Keywords:** *ICT sectors, input-output analysis, simple multipliers*

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**1. Introduction**

Information and Communication Technology (ICT) has become the most important driver of continued growth and development of each economy, which stimulates creation of new and more efficient models of organizational structures in the global economy. ICT can, among other things, play a significant role in globalization of production, as well as in transfer of technologies, enabling constant interaction, regardless of geographical position or time zone via the Internet, mobile communications, digital television and e-commerce.

* 1. **Contribution of ICT to macroeconomic growth and development**

The latest research associated with ICT indicates that dynamics of ICT has indeed become one of the major driving forces for productivity, competitiveness, collaboration, and superposition of resources on both national and international level [33], [41]. The influence of ICT on productivity, economic growth and total development can be observed through the aspect of investment and utilization of ICT, which contributes to total increase in capital by the employee, higher efficiency, rapid technological progress in production of ICT goods and services, and faster growth and development of the sole ICT productive sector [1], [35], [51]. The significance of goods of industrial production is decreasing in the leading industrial countries and, instead of it, the importance of production data and information processing is rapidly increasing. Generally speaking, one can presume that, due to transition from industrial to information society on macroeconomical level, the production and consumption of ICT goods and services is significantly increasing, which finally positively influences the growth and development of economy [9], [27]. This was recognized by the United States of America which intend to invest 7.2 billion dollars in the expansion of ICT and the Internet, as declared in the American Recovery and Reinvestment Act of 2009. Europe has taken a similar path which is reflected in the goals of Digital Agenda: by the year 2020, at least 50% of Europe's population should have Internet access which will be significantly stimulated by the projects.

Many studies have confirmed that ICT can also be classified as the so-called technologies for general purposes, as ICT is a generic technology because its use expands all productive economic and social systems [2]. The main significance of each technology named *general purpose technology* is that its use leads to fundamental changes in productive processes, while other characteristics are fast expansion, technological dynamics and innovative complementarity, which means that productivity in many sectors is increased precisely due to constant progress of ICT technology. The advancement of technologies for general purposes directly reflects on the entire economy in the sense of increased productivity [19]. With regard to these characteristics, ICT is classified in the group of *general purpose technology*, since computers today and all their accompanying equipment are used in nearly all economic and social sectors [5]. The contribution of ICT as a general purpose technology was also confirmed by Jalava and Pohjola [24] whose study shows that the ICT contribution to Finland’s GDP between 1990 and 2004 was three times greater than the contribution of electricity from 1920 to 1938.

ICT appears to have an even greater impact on the economy, considering that it supports many service sectors. This is particularly evident at the present time, when new forms of services are gaining importance, such as e-banking, e-commerce, e-learning, e-health, and others services [15], [45]. Starting from the mid 1990s, majority of researchers have found a positive correlation between ICT investment and economic performance at each aggregation level which includes firm, industry, and country [38], [39], [52], [4], [25], [28]. In the last decade, ICT investment has contributed between 0.6 and 0.2 percentage points to GDP annual growth in OECD countries [37, p. 128]. Moreover, studies on macro-level conducted by van Ark as well as other researchers clearly demonstrate productivity gap which has grown between Europe and the USA, due to a less effective and widespread adoption of ICT by European companies [47], [11], [12], [48], [49], [50], [17], [46], [20], [21], [22].

* 1. **Using IO analysis for determining contribution of ICT to macroeconomic growth and development**

Many studies indicated in the previous sections clearly show that the expansion of ICT and the Internet contributes to positive results, both on a micro and macro level. This section provides an overview of relevant research related to the use of IO analysis in order to determine whether and to what extent intensive investment and use of ICT can generate the desired results of national economies that have recognized their role in growth and development. Thus Bazzazan [3], by using hypothetical extraction method in the IO framework based on the aggregated six-sector IO table in 2001 in which ICT is a main sector, provides an analysis of economic importance of ICT in Iran at the national level. The results of analysis show that, from the demand side, ICT sector is placed in the fourth rank among six sectors with the economic importance of 8.6 percent total output and from supply side it is also placed in the fourth rank with 9.5 percent of total output. Similar positive results of impact of expansion and use of ICT on economic growth is also shown in the analysis that was conducted for the economy of Italy by Di Carlo and Santarelli [14]. The aim of their work was evaluation of the impact on the Italian national economy of investment in ICT by analyzing production and demand multipliers calculated by using IO matrices released by ISTAT for the years 1995, 2000, 2005. The results have shown that ICT has a greater multiplicative effect on the productive system than the non-ICT sectors and, thus, is a key sector for economic growth.

The impact of ICT on a global world level was attempted to be analyzed by Mattioli and Lamonica [31]. In their research, the authors by using the World Input Output Table for the period from 1995 to 2009, measured the relations of the ICT sector to the other productive sectors for the 27 European countries and 13 other major countries which are classified as the highest industrialized countries in the world. For data analysis, Rasmussen forward and backward linkage indices have been used. The study was confirmed that ICT sector has multiplier effect on the other sectors which leads to the conclusion, as well as many previous studies, that ICT sector plays a significant role in the economic systems in the highest developed countries.

On the other hand, there are researches whose results, especially for developed countries, show not such positive, but negative or stagnant results of expansion of ICT according to growth indicators of development.

Study conducted by Rohman and Bohlin [43] aims investigating the contribution of the ICT sectors in driving economic performance in the European economies with a sectoral approach using the IO methodology. The authors, by using the decomposition analysis have confirmed for some countries (e.g. Germany and Spain) that the growth of ICT sectors’ output declined in the period 2000-2005 compared to the period 1995-2000. The study also explains that, at country level, the ICT sectors through time have lost the advantage of export and technological change effects and that the smaller impact of technological change effects is derived from lack of integration among ICT and other sectors on the production side. On the other hand, for France the same analysis showed that the technological change effect remains stable.

Similar results were also shown by the decomposition analysis conducted by Rohman [44] for 10 European economies. The data analysis show the same results as the previous studies that the multiplier effect of the ICT sectors on the rest of the economy decreased during the period 2000–2005, in comparison with the period 1995–2000 and finally that decline in the output of the ICT sectors is connected to the loss of export advantages and technical change gains in the sectors.

Many research of European economies on the regional level also show slow contribution of the ICT sectors on economic growth and development. Also decomposition analysis using IO tables performed by Zuhdi et al. [54], in relation to Indonesia for the period from 1990 to 2005, and Japan for the period 1995 and 2005 with purpose to analyze, from a macro perspective, the role of ICT sectors in contributing to structural changes in the national economies indicate that ICT sectors played an important role in the changes in Japan’s economy, but did not have a significant influence on structural changes in the economy of Indonesia. In further research Zuhdi [55] wanted to get another perspective related to the role of ICT sectors in national economy of Indonesia by employing IO analysis as a tool of analysis for a period of 1990-2005. In this study Zuhdi used simple output multipliers method in order to achieve the purpose. Comparison with previous study was conducted in order to get the objective of this study. Previous study, using Structural Decomposition Analysis (SDA), showed that ICT sectors did not have an important role in Indonesian national economy in the above period. The similar results also appear in this study. In other words, from this study, another perspective related to the role of these sectors in Indonesian national economy in analysis period was not found.

The same author analyze in [56] the impacts of final demand changes on total output of Indonesian ICT sectors in which IO analysis was employed as a tool of analysis in a way that demand-pull IO quantity model was applied in order to achieve the objective. “Whole sector change” and “pure change” conditions are considered in this study. The results of calculation show that, in both conditions, the biggest positive impact on the total output of the sectors is given by the change of households consumption, while the change of import has a negative impact. One of the recommendations suggested from this study is to construct import restriction policy for ICT products.

A similar study was also conducted by Zuhdi and Prasetyo [57] for Japan's economy based on IO table for 2005. The purpose of this study was to analyse the dynamics of total output of Japanese ICT sectors caused by final demand changes. This study also employs IO analysis, an approach in analyzing the interdependence of industries in an economy, as a tool of analysis. The final results show that Japanese ICT sectors have similar pattern. Authors from this study suggested that it is necessary: (1) to enhance the export activity related to ICT sectors, (2) to restrict the import activity regarding ICT products, and (3) to capture more ICT domestic market.

Looking from the perspective of developed and developing countries, an interesting study was conducted by Irawan [23]. The author used comparative analysis based on IO Table for 2005 from four ASEAN Member States, Indonesia, Singapore, Malaysia and Thailand. From the results of conducted analysis can be concluded that in national economies size and structure of ICT sector is important, that the influence of ICT on growth and development depend on the frequency of ICT usage and finally, that countries which are more developed benefit much more from ICT than countries which are less developed.

Reviews of relevant literature related to the Croatian economy using the IO methodology, the impacts of forestry and wood industry, export in the food industry and the textile industry are studied. In all those papers the 2004 IO table of Croatia was employed as reference data.

Authors Lovrinčević and Mikulić in [29] quantified the importance of the forestry and wood industry in Croatia by using the IO analysis. Obtained data showed that multiplier effects of forestry and wood industry were significant. The calculated multipliers indicated high values, especially the output multiplier in section 20 – Wood product, which was also the highest multiplier among all other industries. IO model was in [8] used as one of the main methods to obtain new findings about the state and position of the export of Croatian food industry and its effects on national economy. Type I multipliers and type II multipliers of the gross output, value added and employment were calculated. Multipliers values indicated the strategic importance of food sector for domestic industry. The results also showed that the export of food industry had the highest multiplicative effects on agricultural production and trade. In the paper [7], authors Buturac et al. measured the overall importance of textile industry for the Croatian economy in terms of gross output, value added and employment applying IO analysis. Obtained output and value added multipliers for textile industry were low, while the change in final demand had the strongest direct effect on employment. Multipliers for Croatian economy were relatively low in reflecting the nature of service based economy and losing the competitive position in manufacturing industry.

With the same motivation as the previous researchers, authors of this article wanted to analyze the impact of the expansion of ICT by using IO table for the Croatian economy for the year 2004 and 2010, because to date no similar studies have been published that would investigate issues regarding Croatian ICT sectors by using the IO methodology. The following chapters provide an explanation of the methodology and present research results, conclusions and recommendations based on the obtained results.

* 1. **ICT sector definition and classification**

Many definitions and classifications of the ICT sector come across during a reviewing of relevant literature. As the main data sources for the analysis of the impact of ICT on growth and development of the national economy, symmetric IO tables for 2004 and 2010 of the Croatian Bureau of Statistics and Eurostat [10], [16] are used, it is important to notice that symmetric IO tables for the year 2004 and 2010 are not designed according to the same methodology and classification. Symmetric IO tables for the year 2010 are prepared according to the National Classification of Activities 2007, which corresponds in its content and structure to the Statistical Classification of Economic Activities in the European Community, NACE Rev. 2. This classification differs in structure from the National Classification of Activities 2002 (NKD 2002), according to which the symmetric IO tables for the year 2004 are prepared. National Classification of Activities 2002 corresponds in its content and structure to the NACE Rev. 1.1.

For analysis purposes in this paper the definition that is used to identify ICT economic activities is [13, p. 278]: “The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display”. The used ICT definition provides a statistical basis that measures the part of economic activity that is generated by the production of ICT goods and services and is comparable at the international level. There are three main groups of ICT activities: manufacturing industries, ICT trade industries and ICT services industries. Those groups include the following productive sectors according to the National Classification of Activities 2007 (NKD 2007) in the symmetric IO table for 2010: CPA\_C26 - Computer, electronic and optical products; CPA\_G46 - Wholesale trade services, except of motor vehicles and motorcycles; CPA\_J58 - Publishing services; CPA\_J61 - Telecommunications services; CPA\_J62\_J63 - Computer programming, consultancy and related services, information services; CPA\_S95 - Repair services of computers and personal and household goods.

By the OECD definition [36, p. 11 and p. 17]: “ICT products must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display. Content corresponds to an organized message intended for human beings published in mass communication media and related media activities. The value of such a product to the consumer does not lie in its tangible qualities but in its information, educational, cultural or entertainment content.”, ICT sector consisted of two large groups: ICT products and Content and media products. Based on this definition, in the symmetric IO table for the year 2004, ICT sectors have been detected and according to [30] separated those sectors that correspond to the above mentioned manufacturing, trade and services ICT sectors.

Thus, the sector CPA\_C26 - Computer, electronic and optical products corresponds to the sectors 30 - Office machinery and computers and 32 - Radio, television and communication equipment and apparatus, sector CPA\_G46 - Wholesale trade services, except of motor vehicles and motorcycles corresponds to the sector 51 - Wholesale trade and commission trade services, except of motor vehicles and motorcycles, sector CPA\_J61 - Telecommunications services corresponds to the sector 64 - Post and telecommunication services, while the sectors CPA\_J58 - Publishing services, CPA\_J62\_J63 - Computer programming, consultancy and related services, information services and CPA\_S95 - Repair services of computers and personal and household goods correspond to the sector 72 - Computer and related services.

**2. Research methodology**

Input-output analysis is considered as practical method of quantitative macroeconomic analysis. Its importance was recognized in various aspects of planning the economic development, and its economic significance is also reflected in research and determination of complex quantitative effects of certain economic policy measures and individual emergency interventions in the economic development of the country [42], [53], [34]. Statistical basis of the IO analysis are IO tables. In IO table, the production system of the economy is broken down into a certain number of productive sectors and it is shown how outputs from each sector of the economy are used as inputs by the other sectors.

The equation which shows the dependence of cross-sector flows on the total production of each sector in the IO table represents the basic equation in the IO model [34]. For sector , the equation expressing this dependence is given as follows:

 (1)

where is total output of sector , amount of product of sector used as an intermediate input in the production of sector , and is the final demand of sector , where . Defining the technical coefficient as a ratio of a product of sector that is required by sector in order to produce one unit of its products, the system of equations (1) for the whole economy in matrix form can be rewritten as:

 (2)

where , and .

Matrix is called the technology matrix. A solution to the system (2), where is an -by- identity matrix is:

 (3)

The information about conditions for the matrix and the matrix is more detailed in [40]. Inverse Leontief matrix , also known as multiplier matrix, measures how the total output is changed as a result of the change in the final demand. Elements of the multiplier matrix represent the output of sector directly and indirectly required per unit of final demand of sector .

In this paper, IO analysis is used to calculate simple multipliers. In calculating simple multipliers, open IO table consisting of all production sectors of the national economy with households excluded is used. In the case of the open IO table, elements of the Inverse Leontief matrix indicate the direct and indirect effects per unit of the final demand. Contrary to this, inclusion of households makes the IO table closed. Households are therefore included into calculation of the elements of the Inverse Leontief matrix showing direct, indirect and induced effects per unit of the final demand. [32], [34], [6].

The authors in [18] argued about the output and employment multipliers derived from open and closed IO table. They do not recommend using the multiplier results derived from a closed IO table because they yield exaggerated estimates of the impact of program expenditures on the economy. Several simple multipliers are possible, the ones for output and value added are provided here. Simple multipliers are calculated as the ratio of the direct and indirect effect to the initial effect alone. As the sum of the -th column of the multiplier matrix indicates the output of each sector of the economy directly and indirectly required per unit of final demand of sector and how the initial output effect on the economy is defined as initial monetary unit’s worth of sector output needed to satisfy the additional final demand, simple output multiplier for the sector is defined as:

 (4)

Simple value added multipliers express the value added of the economy directly and indirectly required per unit of final demand. For the sector , simple value added multiplier is computed by multiplying the -th column of the multiplier matrix by the value added generated per unit of its output, i.e.:

 (5)

**3. Research results**

Based on the symmetric IO tables for 2010, it is determined that the total output of all sectors that include ICT activities at basic prices was around 23.1 billion kuna. Total intermediate consumption of domestic products of the ICT sectors was around 7.6 billion kuna, while the total gross value added amount around 13.4 billion kuna. Out of all ICT sectors, sector 61 was noted the largest share in the total output of all ICT sectors (around 43.1 percent), the largest intermediate consumption of domestic products (around 3.2 billion kuna) and the largest gross value added (around 6.1 billion kuna), while sector 95 had the lowest share in the total output of the ICT sectors (around 4.4 percent), the lowest intermediate consumption of domestic products (around 312.3 million kuna) and the lowest gross value added (around 628.5 million kuna).

|  |  |  |  |
| --- | --- | --- | --- |
| Activity sections codes | Description | Output multiplier | Value added multiplier |
| A | Agriculture, forestry and fishing | 1.598 | 1.557 |
| B+C+D+E | Mining and querrying; Manufacturing; Electricity, gas, steam and air conditioning supply, sewerage, waste management, remediation activities | 1.647 | 1.848 |
| F | Construction | 1.716 | 1.948 |
| G+H+I | Wholesale and retail trade; repair of motor vehicles and motorcycles; Transportation and storage; Accommodation and food service activities | 1.589 | 1.577 |
| J | Information and communication | 1.580 | 1.530 |
| K | Financial and insurance activities | 1.506 | 1.413 |
| L | Real estate activities | 1.140 | 1.105 |
| M+N | Professional, scientific and technical activities; Administrative and support service activities | 1.571 | 1.549 |
| O+P+Q | Public administration and defence; compulsory social security; Education; Human health and social work activities | 1.410 | 1.304 |
| R+S+T+U | Arts, entertainment and recreation; Other service activities; Activities of households as employers; Activities of extraterritorial organisations and bodies | 1.500 | 1.437 |

Table 1: Output and value added multipliers for the Croatian economy

Table 1 shows the values of the output and value added multipliers for 2010 for various sectors of the Croatian economy according to NKD 2007 activity sections. According to the values of multipliers, it can be noted that the activity F - Construction had the highest ability to contribute to the economy while the activity L - Real estate activities had the lowest contribution to the economy.

|  |  |
| --- | --- |
| Year 2004 | Year 2010 |
| Sector code | Output multiplier | Sector code | Output multiplier |
| 30 | 1.694 | CPA\_C26 | 1.581 |
| 32 | 1.798 |
| 51 | 1.676 | CPA\_G46 | 1.601 |
| 64 | 1.536 | CPA\_J61 | 1.484 |
| 72 | 1.479 | CPA\_J58 | 1.691 |
| CPA\_J62\_J63 | 1.475 |
| CPA\_S95 | 1.456 |
|  |  |  |  |

|  |  |
| --- | --- |
| Year 2004 | Year 2010 |
| Sector code | Value added multiplier | Sector code | Value added multiplier |
| 30 | 1.682 | CPA\_C26 | 1.631 |
| 32 | 1.875 |
| 51 | 1.651 | CPA\_G46 | 1.600 |
| 64 | 1.489 | CPA\_J61 | 1.404 |
| 72 | 1.426 | CPA\_J58 | 1.835 |
| CPA\_J62\_J63 | 1.407 |
| CPA\_S95 | 1.418 |

Table 2: Output multipliers for ICT sectors Table 3: Value added multipliers for ICT sectors

 for 2004 and 2010 for 2004 and 2010

In case of the ICT sectors for 2010, Table 2, the largest output multiplier of 1.691 has sector CPA\_J58, which means that a unit increase in final demand is expected to increase national output by around 1.691 units. Medium output multipliers are identified in sectors CPA\_C26 and CPA\_G46 with values of 1.581 and 1.601 respectively. The lowest output multiplier of 1.456 was in sector CPA\_S95, which could be related to the fact that the performance of ICT technology is rapidly changing on a daily basis and affordability of this technology has become acceptable. Therefore, more users decide to buy a new technology rather than repairing or upgrading the existing one. Sectors CPA\_J61 and CPA\_J62\_J63 which are, as previously mentioned in sector CPA\_S95, part of ICT services industries had relatively low output multipliers, values below 1.5. Similar conclusion of the above mentioned sectors can also be drawn for value added multiplier.

In an attempt to compare the values of the output multiplier and value added multiplier of the ICT sectors for 2004 and 2010 in Croatian economy, for 2010 the decrease in the values of the multipliers compared to 2004 are observed, but not significant (Table 2, Table 3).

Similarly, the authors in [26] are, based on the calculations of total sectoral multipliers for all sectors of the Croatian economy using symmetric IO tables for 2004 and 2010, concluded that significant changes in cross-sectoral relations during these two periods did not occur and that in most comparable activities overall sectoral multiplier decreased.

Hereafter, output and value added multipliers for new and long-standing members of EU are discussed (Table 4, Appendix 1 and Table 5, Appendix 2). By comparing the minimum and maximum values of the output and value added multipliers for almost all ICT sectors, a gap between the new and long-standing members in the minimum and maximum values has been observed, which indicates that the long-standing members utilized ICT in economic growth and development purposes more efficiently.

In fact, for the sector CPA\_C26, which is included in manufacturing, new member states of EU had the lowest output multiplier of 1.131 (Hungary), and the highest of 1.595 (Slovenia). For the same sector, but for the long-standing member states of EU, the lowest value of output multiplier was detected for Belgium (1.524) and the highest for France (1.849). In the ICT trade sector CPA\_G46, difference in the maximum (0.011) and in the minimum values (0.028) of output multiplier for new and long-standing member states of EU is almost negligible. Among the services ICT sectors, differences between sectors CPA\_J58 and CPA\_J61 and sectors CPA\_J62\_J63 and CPA\_S95 are found. In sectors CPA\_J58 and CPA\_J61 for new member states of EU, lower minimum values of the multipliers are occurred than for long-standing members, as well as lower maximum multiplier values. In contrast, sectors CPA\_J62\_J63 and CPA\_S95 had lower minimum values of the multiplier in new member states of EU, but greater maximal values of the multipliers in long-standing member states of EU. Differences in the minimum and maximum values of the value added multiplier for the above analyzed sectors between new and long-standing member states of EU do exist, but they are not significant.

**4. Conclusion**

Rapid technological progress in production of ICT goods and services and faster growth and development of the sole ICT productive sector has a significant impact on productivity and efficiency of all the other sectors of national economies, as well as on growth and total development of social and economic systems as a whole. During work, the impact of ICT via IO method is quantified by calculating simple multipliers of output and value added. The data used for conducting the analysis were taken from the data base of Croatian Bureau of Statistics and Eurostat for 2004 and 2010. A comparative analysis of multipliers based on accessible symmetric IO tables was made for the ICT production, service and trade sectors of Croatian economy. The analysis results indicate that the differences in multiplier values in the period in question for the sectors mentioned were not significant. The values of output multiplier for ICT sectors ranged from 1.479 to 1.798 in 2004 and from 1.456 to 1.691 for 2010, while the values of value added multiplier ranged from 1.426 to 1.875 in 2004 and from 1.407 to 1.835 for 2010, which leads to conclusion that the ICT contribution to growth and development in Croatian economy decreased with years.

By using the latest data for 2010, an analysis of output and value added multipliers was made for all sectors of Croatian economy, which were classified according to NKD 2007 activity sections and a comparison to the multipliers of the ICT sectors was made. Results show that the average values of output, as well as of value added multipliers for all ICT sectors range at about 1.5, which is consistant to the majority of multiplier values for all other activity sections according to NKD 2007, with the exception of activity section L - Real estate activities and activity section O+P+Q - Public administration and defence; compulsory social security; education; human health and social work activities with the lowest multiplier values and the activity section F - Construction and the activity section B+C+D+E - Mining and querrying; manufacturing; electricity, gas, steam and air conditioning supply, sewerage, waste management, remediation activities with the highest values. Moreover, a comparative multiplier analysis was conducted for a couple of EU countries which were, for the purpose of this thesis, classified in two groups: the new and the long-standing EU members, with the purpose of establishing whether the ICT contributes to growth and development equally in long-standing member countries, as opposed to the new members. The results acquired indicate the divide in the multiplier values between the new and long-standing members and the conclusion of this analysis is that long-standing members have capitalized the ICT sectors potentials more with the purpose of growth and development, as opposed to the members which have subsequently joined the EU.

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| --- | --- |
|  | Sectors codes |
|  | CPA\_C26 | CPA\_G46 | CPA\_J58 | CPA\_J61 | CPA\_J62\_J63 | CPA\_S95 |
| New member states of EU | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier |
| Croatia | 1.581 | 1.631 | 1.601 | 1.600 | 1.691 | 1.835 | 1.484 | 1.404 | 1.475 | 1.407 | 1.456 | 1.418 |
| Slovenia | 1.595 | 1.693 | 1.683 | 1.625 | 1.868 | 2.250 | 1.852 | 2.009 | 1.552 | 1.539 | 1.402 | 1.451 |
| Czech Republic | 1.328 | 2.824 | 1.862 | 1.831 | 1.897 | 2.085 | 1.618 | 1.563 | 1.808 | 1.793 | 1.782 | 1.815 |
| Slovakia | 1.463 | 2.558 | 1.567 | 1.493 | 1.548 | 1.569 | 1.654 | 1.599 | 1.571 | 1.519 | 1.174 | 1.155 |
| Hungary | 1.131 | 1.692 | 1.563 | 1.635 | 1.654 | 1.694 | 1.431 | 1.394 | 1.365 | 1.332 | 1.438 | 1.442 |

Appendix 1

Table 4: Output and value added multipliers for ICT sectors for new member states of EU for 2010

Appendix 2

|  |  |
| --- | --- |
|  | Sectors codes |
|  | CPA\_C26 | CPA\_G46 | CPA\_J58 | CPA\_J61 | CPA\_J62\_J63 | CPA\_S95 |
| Long-standing member states of EU | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier | Output multiplier | Value added multiplier |
| Germany | 1.654 | 1.812 | 1.773 | 1.756 | 1.840 | 1.937 | 2.016 | 2.396 | 1.493 | 1.451 | 1.316 | 1.205 |
| France | 1.849 | 2.430 | 1.769 | 1.781 | 1.818 | 1.836 | 1.881 | 1.933 | 1.609 | 1.511 | 1.488 | 1.387 |
| Italy | 1.689 | 1.885 | 1.873 | 1.843 | 1.904 | 2.012 | 1.811 | 1.731 | 1.698 | 1.654 | 1.652 | 1.480 |
| Belgium | 1.524 | 1.714 | 1.592 | 1.546 | 1.799 | 1.815 | 1.685 | 1.667 | 1.782 | 1.814 | 1.699 | 1.707 |
| United Kingdom | 1.710 | 1.720 | 1.786 | 1.816 | 1.683 | 1.638 | 1.465 | 1.450 | 1.461 | 1.396 | 1.462 | 1.419 |

Table 5: Output and value added multipliers for ICT sectors for long-standing member states of EU for 2010