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Economic Impact of Information and Communications Technology – Identifying Its Restraints and Exploring Its Potential

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1. Introduction

Information and communications technologies (ICT) facilitate the introduction of new relationships, interactions, distribution of forces and novel moments into the classic economic settings. The prominent role of these technologies explains why they provide a challenging topic in the context of the newly arisen economic, technological and even social relationships. Whereas companies are adapting organizationally and are seeking new business models, customers are changing their customer habits and purchasing modes. The state, on its part, is opening up new channels of communication with citizens in the attempt to improve the quality of its services. Regardless of whether the economy in this new context is entitled as the "Knowledge Economy" or the "New Economy", it is profoundly related to ICT that enable networking, knowledge spillover, reduction of costs and allow for new entrepreneurial opportunities. The issues that economic experts need to address are whether economy has actually changed with the advent of ICT and how this new input can be exploited. They also need to identify challenges that have arisen with ICT, including the technological limitations and ways of overcoming them. From the macroeconomic aspect, their impact on productivity and growth as well as on labour market and employment should be considered. On the other hand, from the microeconomic aspect, the impact of ICT concerns the issues of efficiency, competitiveness, changes in market structure, business strategies, emerging industries and the effect of those technologies on opening up of new entrepreneurial opportunities. This overview of impacts of ICT on economy focuses on microaspects, particularly regarding the dynamic processes among companies in the ICT sector. In that respect, it is notable that macro- and micro-level are interdependent and intertwined, which explains why it may sometimes be difficult to draw a clear line between the two. Nevertheless, the truth remains that phenomena of major importance occur in the microeconomic spheres, in other words, in companies and industries.

2. Macroeconomic aspects

2.1 Growth and productivity

Generally speaking, when economy is concerned, productivity growth is imperative. More specifically, discussions related to the impact of ICT on growth and productivity have

commonly been reminiscent of the statement made by Solow: "We see computers everywhere except in the productivity statistics." Since the 1950s, the models of growth have considered the impacts that work, capital (human and physical) and the so-called residuals upon growth. The question arises of how these production factors can be combined to achieve optimal efficiency, in other words, total factor productivity. The latter refers to various improvements in the area of efficiency, such as improvements in the managerial practice, organizational changes and, in most general terms, innovative approaches to production of goods and services. It is this segment, also referred to as a residual, that has come into spotlight with the arrival of the New Economy. ICT form part of that residual, although they are by no means their sole component. These technologies are a powerful tool that is penetrating all the segments of production, allows for a more efficient allocation of resources, creates new needs, generates the demand, and is the driving force behind new industries and jobs. At the same time, the vast contribution of ICT to the development of scientific disciplines and other industries as well as their efficiency should be emphasized. The research into the impact of ICT on the increase of productivity has so far focused on three mechanisms. The first of them is their impact through production in the ICT sector. In most countries, the sector that produces ICT has a minor role in respective economies. Nevertheless, that minor sector can have a relatively significant contribution to productivity and growth if it increases faster than the rest of the economy. There are simple statistical analyses that reveal a positive correlation between the segment of the sector that pertains to manufacturing and the increase of the total factor productivity, although they refer to a fairly small number of countries, notably Finland and Ireland (OECD, 2001). Such a positive correlation is to be expected on account of the high rate of technological progress and the total factor productivity growth in ICT manufacturing. However, certain countries whose ICT sector is relatively small, such as Australia, are also experiencing a total factor productivity growth, which entails that the size of the ICT sector is not a prerequisite for total factor productivity growth (OECD, 2002). The second mechanism is the ICT implementation in business activities, which will be further discussed in the section on ICT and entrepreneurship. The third mechanism is technological spillovers. The impact of ICT is visible if ICT investment is accompanied by other changes and investments (Pilat, 2004). ICT primarily affect companies that tend to promote their expertise and know-how and introduce organizational changes. Yet another key factor are innovations since users facilitate that investments into technologies such as ICT become more worthwhile through experimentation and invention. Without the process of complementary innovations, economic impact of ICT would be limited. Research also shows that the adoption and impact of ICT varies from company to company, depending on their size, type of activity, the company's founding year etc. The studies based on longitudinal data emphasize the interaction between ICT and human capital. (Bartelsman & Doms, 2000). Although some longitudinal data bases used in those studies contain data on the employees' knowledge, skills and occupations, most of them interpret human capital in terms of wages claiming that positive correlation exists between them and the employees' knowledge and skills. Companies that adopt advanced technologies increase their expenditure on education and training. Managerial teams that focus on perfecting the quality of their companies' products by adopting an aggressive human resources strategy achieve faster growth by continually improving their employees' knowledge and skills through training and hiring of new staff (Baldwin et al., 2004). All the aforementioned studies refer to developed countries. In the 1990s and early 2000s their economic experts were intensively engaged in elaborating and

researching the economic aspects of growth, production and ICT implementation. For other groups of countries that are not so well developed the essential aim is to achieve convergence with the developed countries. One of the shortcomings of transition countries, among which is Croatia, is insufficient exploitation of opportunities that ICT provide for the economy. On the other hand, these countries are in a position to apply the lessons learned by the developed countries (such as USA, the developed EU members etc.) and adapt their own policies supporting the ICT sector development and their implementation in business. In the period 2001-2004 the share of ICT sector in the Croatian economy in terms of the total revenue amounted to 3%, without significant fluctuations over the mentioned period (Kovačević & Vuković, 2007). Its comparison with the size of the ICT sector (measured by its share in the economic added value) for EU countries, Norway, USA, Canada, Japan, Australia, Korea and Taiwan shows that the size of the ICT sector ranges between 3% (Greece) to just short of 12% (Ireland) of the total output, whereas the EU average is 5% of the total production (European Commission, 2006). In the context of the developed countries the need for expanding the ICT sector in Croatia is further emphasized, especially when its extraordinary growth is considered. Namely, the total revenue growth in the ICT sector has exceeded that in the economy as a whole, although it has paralleled the dynamics of the increase, that is, the decrease in the total revenue of the entire economy. ICT services have experienced a more rapid growth than the average of the ICT sector, which makes them the engine of the ICT sector growth. The productivity coefficient[1] of the ICT sector in Croatia grew steadily between 1997 and 2004 (see Figure 1).

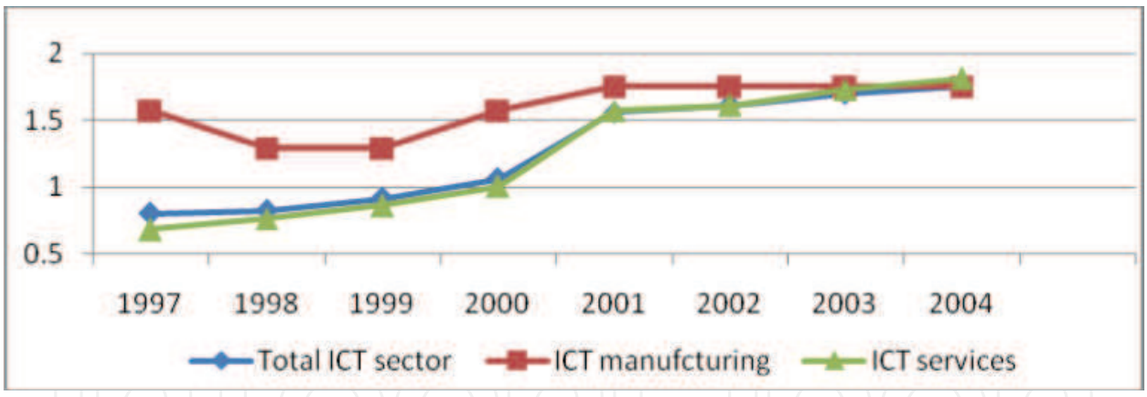


Fig. 1. Productivity coefficient trends in the total ICT sector, ICT manufacturing and ICT services (1997-2004)

In the same period (1997-2004), the ICT manufacturing displayed above-average productivity. ICT services industries in Croatia in that period also increased their productivity. Croatia has a potential for the development of the ICT sector, but companies need institutional support if that potential is to be exploited.

[1] Productivity coefficients are calculated as the share of the total revenue of a sector or its part (in this case, ICT manufacturing and ICT services) in the total revenue of the entire economy divided by the share of employees in that particular sector or its part in the total number of employees in a given economy. Values above 1 indicate productivity that is above the average of that of a given economy, whereas values below 1 indicate productivity below the average of that particular economy.

2.2 Labour market

In the time when creating new jobs is becoming more challenging than ever, the question of the impact of ICT on employment needs to be addressed. The impact of new technologies on employment and wages has been a subject of numerous discussions for a few centuries (Kalmbach & Kurz, 1986). Freeman & Soete (1997) mention the Physiocrats.[2] In the 1940s, following the Second World War, Norbert Wiener forecast that the invention of the computer would result in such huge job losses "that the depression era unemployment rates would seem like a picnic". Consequently, the question arises of the actual potential of ICT in employment, which is highlighted by the fear that certain groups within the workforce will have increasingly smaller employment prospects owing to a lack of qualifications needed. From the historical perspective, taking a long-term view, it could be said that the job creation effect has exceeded the job destruction effect. Nevertheless, it was Ricardo who brought to attention the idea that new jobs will not be analogous to the old jobs in terms of the required skills. This problem of incompatibility between skills and qualifications represents structural unemployment and entails the problem of structural adaptation. In that sense, both direct and indirect effects of ICT should be considered. The indirect effects of the ICT revolution are particularly visible, in the light of Schumpeter's analysis of the "bandwagon effect" following which the opening up of new markets is generated and numerous opportunities for profitable investments are created (Freeman & Soete, 1997). Regardless of whether the questions of the number of employees, sector composition or job structure are concerned, it is hard to accurately forecast the impact of ICT on employment. Several factors determine whether the job creation effect or the job destruction effect will prevail, including: the individuals' behaviour and adaptation to new circumstances and their ability to position themselves in the labour market; macroeconomic policy; employment policy; educational policy. The impact of ICT on employment and labour market should be viewed through the prism of several different questions, including labour demand, skill requirements, wage differentials and geographical dimension. The first question is that of labour demand. Owing to the rise of new industries, vast employment opportunities have already been introduced, most notably in the software industry, industries producing digital goods (films, music), service industries with an intensive use of ICT (banking, commerce). It is very likely that some other service industries in the area of information and communications will enable new employment opportunities. There is a notable impact of the new ICT on employment in the service sector, especially with regard to the Internet, where the speed of changes occurs outside of the controlled liberalization of processes and entails a far more dramatic process of "creative destruction" with a new price structure and changes in the market structure. The second question concerns skill requirements. Economic debates on employment are focused on the skill-biased nature of the more recent technological change. The skill-biased technical change hypothesis deals with creating the need for a highly-qualified workforce arising from ICT implementation, which in turn leads to the rise in wage differentials. ICT both presuppose and cause

[2] The Physiocrats, whose theories in 1760 claimed that land agriculture was the only truly productive economic activity and expressed their concern that the redistribution of French workforce across other activities would reduce national wealth. In the five decades that followed the share of agricultural workers in the French workforce gradually declined. At the same time, owing to productivity growth, the average wages increased by one quarter, while the unemployment did not rise significantly. Similar pessimistic outlooks were expressed by Ricardo and Marx.

structural adaptations of individuals, companies, industries, governments and other institutions that are learning, mainly through trial and error, how to optimally harness these new technologies. Workers tend to become more productive once they have acquired experience in using them. One of the essential problems at the microlevel is that of distribution of skills and incomes caused by structural changes. These changes have given rise to new challenges for policy makers. On the one hand, adaptation to information society requires significant changes in the demand for various types of education and skills. On the other hand, it is very likely that a considerable segment of the unskilled workforce will be excluded. ICT enable the codification of a major part of human skills due to the ability to memorize, store, quickly manipulate and interpret data and information, which is inherent in these technologies. With respect to their specific nature, different types of knowledge distinguish themselves according to tacitness (that is, the presence of tacit knowledge), perceivability, complexity and systemic nature (Winter, 1987). Knowledge can range widely, from highly tacit to completely articulated, depending on the ease with which it can be transferred. Perceivability denotes the amount of knowledge that is disclosed upon the very implementation of knowledge. The complexity degree refers to the quanitity of information that is needed for a problem to be properly defined and the knowledge required for creating alternative solutions. The systemic nature of knowledge indicates whether certain knowledge is completely self-contained and usable in its own right or presents an element of an interdependent system and as such only has significance and value if considered in a specific context. Tacit, imperceptible and complex knowledge that is an element of a larger system is hard to transfer. On the other hand, articulated, perceivable, simple and self-contained knowledge can be easily transferred. Nevertheless, the larger the proportion of knowledge that can be codified, the more significant the remaining knowledge that does not lend itself to codification will be. Since most routinized skills are becoming codified, their importance is diminishing. The required society-wide response to this trend in the context of employment would be to provide education and training for all social groups to ensure that some of them, such as unskilled individuals and the segment of the workforce that possesses routinized skills, are not excluded from economic activity. Apart from the issues of economic and social exclusion resulting from a lack of appropriate skills, the problem of the rise in wage differentials needs to be considered. This problem, which has been a prominent topic of investigation in the field of labour economics over the last thirty years, is mainly dealt with from the perspective of skill requirements, although its interpretations are sometimes also related to trade union erosion and minimal wages that protect low-skill workforce (Morettti, 2008). When it comes to employment in Croatia, it is notable that, in spite of the growing unemployment resulting, on the one hand, from global recession and, on the other, from structural changes in the economy, the demand for ICT experts is not diminishing. Differences between the average wage in Croatia and those in the ICT sector should not be disregarded either. ICT enable a global approach to information and knowledge, and provide companies with the opportunity to reallocate routinized activities that can be traded at the international level. These technologies contribute to economic transparency and generally imply cost reduction achievements resulting from the usage of alternative locations and international outsourcing of particular jobs. However, the question persists of the global distribution of benefits yielded by ICT. Similar to the trend described at the national level, two possible scenarios can be envisaged at the global level. According to the first scenario, ICT and corresponding policies will enable everyone to

access labour market and thus reduce the wage differentials. According to the second, the winner-take-all-races principle will prevail. Undoubtedly, the ICT impacts on employment will depend on macroeconomic policy, institutional and legislative reform of the labour and commodity market, technological policy, new distribution policy, the policy that aspires to productivity growth, as well as one that will be aimed at integrating ICT in the society. Compatibility between technology, politics and institutions over a longer period of time may eventually result in full employment.

3. Microeconomic aspects

3.1 Impact on competitiveness and market structure

ICT are significantly contributing to the process of creative destruction through the birth of new companies and industries and the mortality of the less successful enterprises. Such developments have a visible effect on industrial structure as well as implications on employment. Directly or indirectly, ICT can reduce the transaction cost and market friction thus affecting competitive positioning. In high-technology industries, such as ICT, technological changes occur rapidly and competition is based on Schumpeterian innovation. The essential feature of new industries is the process of competition dominated by efforts for creating intellectual ownership through research and development. This often results in a rapid technological change that entails changes in market structures. The widely used term "New economy" corresponds to the spirit of Schumpeterian creative destruction in which innovations are destroying old industries and creating new ones (Schumpeter, 1942). Nowadays, creative destruction has been embraced as a concept beyond economic theory itself. Institutions, whether regional, national, or global, use this term as the point of departure in their policies or recommendations for facilitating growth. The goal is to enable new entrants to more easily gain access to markets and aid the most successful ones to grow. Schumpeter considered the entrepreneur to be the agent of change. However, depending on whether he considered the origin of progress to lie in small or big enterprises, he himself would change his mind thus giving rise to two innovativeness models. He proposed his first model, entitled Schumpeter Mark I, in his book *The Theory of Economic Development* (1934), where he investigated a typical European industrial structure at the end of the 19th century characterized by a large number of small companies. According to Schumpeter, the key features of the model of innovative activity at the time were the technological ease of entry into an industry and a major role of small enterprises in performing innovative activity. The second model, entitled Schumpeter Mark II, discussed in the book *Capitalism, Socialism and Democracy* (1942), was inspired by characteristics of the American industry in the first half of the 20th century. In this book Schumpeter emphasized the relevance of industrial research and development (R&D) laboratories for technological innovation as well as the key role of big enterprises. This view suggests that the model of innovative activity is characterized by the dominance of the existing big enterprises and relevant entry barriers for new innovators. Big enterprises have institutionalized the innovative process by creating research and development laboratories inhabited by researchers, technicians and engineers. Nowadays it has been widely accepted that enterprises are heterogeneous. Consequently, the Theory of the Representative Agent has been abandoned. The heterogeneity of enterprises is manifested in two dimensions: enterprise features (size, technology, behaviour) and performance (competitiveness, profitability etc.). Enterprises differ in their size, level of education of their employees, wages and investment in staff training. Within the population

of enterprises, survival chances of many small enterprises, and occasionally big ones as well, are being changed. Economic experts generally agree that "destruction, however painful, is the necessary price of creative progress toward a better material life" (McCraw, 2007). Theoretical discussions and empirical research emphasize "production efficiency" and "dynamic efficiency" which can be broadly defined as productivity growth through innovations (Evans & Schmalensee, 2001). Production (or technical) efficiency arises from innovations through which new or better production methods are introduced that, in the long run, will lead to a higher productivity rate, which means achieving the "dynamic efficiency", most commonly through research and development. Intensive investment into creating intellectual ownership results in a substantial scale economy, which results in seller concentration. These phenomena, although typically associated with endogenous sunk costs industries, in which costs related to advertising, research, product design and development are important aspects of competition (Sutton, 1991), are particularly visible in high-technology industries. Such investment is directed at increasing the demand by creating new markets or increasing the buyers' readiness to pay for the existing products or services (Kaniovski & Peneder, 2002). Each selective environment that encourages competition for the required product quality generates investments through research and development, advertising or human resources. Provided that technological potential exists and that the customers are ready to accept new combinations on the side of the supply, the nature of differences in the growth at the industry level becomes endogenous with regard to entrepreneurial activity (Peneder, 2001). A higher ratio of entrepreneurial type of industry would imply a higher capacity of an economy for generating income and growth. However, market leadership cannot be considered to be a steady condition as there is a constant threat of drastic innovations on the part of competition. Still, certain authors suggest the possibility of creative construction (Agarwal et al., 2007) and express a fairly optimistic attitude on construction as an alternative to destruction. They exemplify this alternative process by means of the knowledge spillover mechanism leading to creation of new ventures and, ultimately, industrial and regional growth.

3.2 Entrepreneurial characteristics of the ICT sector in Croatia

Industries in the ICT sector are young and feature a large number of small enterprises. It is on examples of enterprises in the ICT sector that the relative innovative advantage of small enterprises in highly innovative industries (Acs & Audretsch, 1987) is particularly notable. For instance, a research on innovativeness in Croatia (Račić, 2005) shows that service enterprises in the ICT sector are among the three most innovative companies in the entire service sector. Generally speaking, new technologies have reduced the significance of scale economies so that even small enterprises that successfully implement innovations can thrive in the growing market. Structural changes, which account for a higher share of services in economies, have opened up new possibilities for entrepreneurship in the service sector. For instance, out of 6.6 million employees in the ICT sector in EU, 27.5 million (75.5%) are employed in the service sector. That sector is characterized by a low level of initial capital investment, whereby entry barriers are minimized and the beginning of functioning of a new small enterprise is facilitated (Verheul et al.). Europe has been experiencing an increase in research and development expenditure in the service segment of the ICT sector, especially in the software industry, which has compensated for the decrease in the research and development expenditure in ICT manufacturing (European Commission, 2009). The statistical data obtained in our research on the contribution of the ICT sector to Croatian

economy showed that the share of the Croatian ICT sector in the economy is relatively small but is growing faster than the rest of the economy. The research also revealed above-average dynamic processes in industries manifested through above-average growth and productivity with respect to the economy as a whole. The ICT sector itself is heterogeneous concerning the differences in structural and dynamic features of particular industries (Kovačević & Vuković, 2006). The heterogeneity was determined on the basis of observing the following characteristics of industries: enterprise size distribution, distribution of employees across small, medium and big enterprises, market shares, productivity, profit and profit rates, entry barriers (capital intensity and minimum efficient size), entry rates, exit rates, enterprise survival. This heterogeneity is already evident at the moment of dividing the sector into the manufacturing segment and services. When the Croatian ICT sector is concerned, the service industry outperforms manufacturing. ICT services have been growing faster than the average of the ICT sector, and the dominant number of employees in the ICT sector belongs to services. The minimum efficient size, which is taken in research as a measure of scale economies or a measure of sunk cost, can negatively affect entry (entry barrier) if a huge output is required for potential entrants to reap the benefits from economies of scale. The minimum efficient size in ICT sector industries (calculated as the average of the total revenue per company over a four-year period and divided by one thousand for easier readability) shows that this determinant is not an obstacle for new enterprises to enter the ICT sector. There are exceptions (see Table 1), in which the minimum efficient size is fairly large (telecommunications, manufacture of insulated wire and cable, manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy). A small minimum efficient size in most industries in the ICT sector speaks in favour of the conclusion that a smaller minimum efficient size of an industry increases the survival chances of the enterprises in that particular industry. In markets in which companies smaller than the minimum efficient size constitute a major share in the industrial population, new companies may stand better chances for survival. Industries in the ICT sector are not capital intensive. Instead, if we consider new investment concepts, such as the so-called extended investment concept that also includes human capital, it can be said that ICT industries are human capital intensive.

For an approximate illustration of human capital intensiveness (for lack of other data) we used the data on average wages in certain industries in the ICT sector. The average wage in the ICT sector is above the Croatian average; in 2000 it was nominally 20% above the average. In 2002 this difference was 19%, in 2003 it was 15% and in 2004 it amounted to 19% (Kovačević & Vuković, 2006). The lack of entry barriers has resulted in high entry rates to the ICT industry. Net entry rates provide an insight into general tendencies in demographic trends in the industrial population on the entry side. A somewhat vague impression made by net entry rates arises from the fact that the net rate conceals the actual scope of gross entries into each industry. The extent to which net entries differ from the actual number of entries depends on the scope of exits from the industry. Net entry rates represent a simpler method of calculating entry than calculating gross entry rates since it is not necessary to track data for each entrant and incumbent company separately. Instead, the total number of enterprises within a given period is considered. Net entry rates are calculated as follows:

$$\text{Net entry rate} = \frac{N_t - N_{t-1}}{N_{t-1}} \tag{1}$$

Where N_t refers to the total number of enterprises in year t, and N_{t-1} to the total number of enterprises in year $t-1$. According to research in developed countries and in Croatia, high entry rates in ICT industries support the product life cycle theory (Vuković, 2006). That theory suggests that entry rates are particularly high in young industries (see Figure 2). High entry rates in this sector can also be interpreted as support to vintage models and models of economic growth which emphasize the importance of creative destruction as a prerequisite for innovations. All the aforementioned theories imply that innovative activity and the adoption of new technologies are related to the process in which new and innovative companies replace the old, less productive ones. The structure of the economy is also changed in the process.

Industry	Minimum efficient size
Manufacture of office machinery	4,2
Manufacture of accounting and computing machinery	8,2
Manufacture of insulated wire and cable	80,3
Manufacture of electronic valves and other electronic components	3,8
Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	32,7
Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods	2,0
Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposed, except industrial process control equipment	2,0
Manufacture of industrial process control equipment	2,4
Wholesale of computers, computer peripherial equipment and software	9,9
Wholesale of other electronic parts and equipment	4,3
Renting of office machinery and equipment, including computers	3,6
Telecomunications	215,8
Hardware consulting	3,0
Software supply and software consultancy	1,6
Dana processing	1,5
Dana base activities	2,1
Maintenance and repairing of office and accounting machinery, and computers	3,0
Other computer related services	2,0

Table 1. Minimum efficent size in ICT industries in Croatia

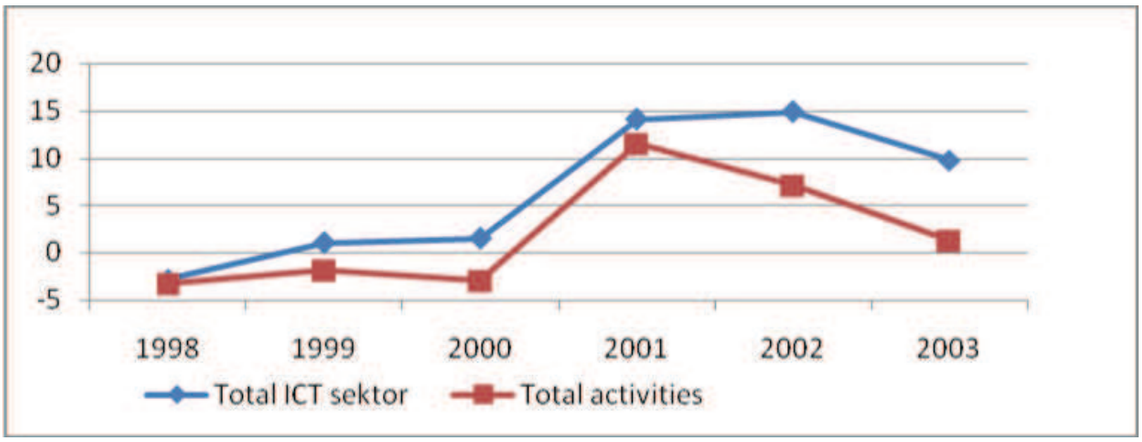


Fig. 2. Net entry rates of companies in the ICT sector and the total of all the activities in Croatia

High net entry rates, considerably above the average of a given economy, are indicative of an entrepreneurial regime or expansion model, which is characterized by huge innovation and imitation potential, both of which allow for a continuous entry of new companies into the industry. The technological regime concept provides a description of the technological environment in which a company performs its business activity. The technological regime identifies the characteristics of the learning process, sources of knowledge and the nature of knowledge bases. In literature two technological regimes are distinguished: the "entrepreneurial" regime facilitates an innovative entry, while the "routinized" regime makes innovation easier for the existing incumbent firms (Winter, 1984). Research in Croatian ICT sector confirms the hypothesis stated in the literature according to which the entry of small enterprises originates from three principal sources: positive impact of fast-growing industries and high technological opportunity, lack of entry barriers and companies' reliance on strategies which facilitate market entry. According to the lifecycle theory, entry rates will decrease (which is evident in the figure above), and the character of technological regimes is also likely to change with time owing to mobility among enterprises (that is, with small enterprises becoming medium and big enterprises). Every year major companies in the ICT sector improve their ranking. Some of them are among the leading businesses in the entire economy. It is the largest enterprises that have contributed to the growth of the ICT sector. As in the economy on the whole, in the ICT sector big companies are gaining importance, occupying an ever larger share in the total revenue and profit after taxes at the expense of small enterprises. The existing manufacturers will accumulate knowledge through learning by doing process. A wider knowledge base will probably lead to a larger minimum enterprise size and mobility of incumbent companies. Enterprise turnover rates (that is, sums of entries and exits) in certain industries are very high owing to high entry rates : telecommunications 30.6%, computer equipment consulting 20.2%, database development and management 19.66%, and other computing activities 20.48% (Vuković, 2006). The average turnover rate in the service segment of the ICT sector is considerably higher than that in the manufacturing segment of the ICT sector. The majority of companies in the ICT sector belong to the category of small enterprises. The fact that the largest part of the ICT sector is constituted by small enterprises highlights the entrepreneurial character of the sector. A fairly

modest ratio of employees in the total number of employees within the economy as well as the modest employment growth in the ICT sector in this case indicate a neutral influence of entrepreneurship on employment. In general, it can be said that the beginning of the transition process in Croatia was recognized as an opportunity for the establishment of independent businesses, which is documented by the number of newly founded small enterprises in Croatia by 1995 (Kovačević, 2001). In the ICT sector a large number of small enterprises also emerged. This coincided with the disintegration of big computing centres, whose engineers and ICT experts would start up their own businesses. Popular entrepreneurship theories emphasize motives that serve as an impetus for starting an entrepreneurial venture: risk taking, managerial ability, wealth, preferences for control, flexibility and other job attributes that come with being one's own boss (Ohyama et al., 2009). Other tendencies we have noticed by monitoring industrial dynamics and evolution of ICT industries in Croatia have also been pursued in the recent entrepreneurship theory: successful new start-ups are founded by gifted individuals whose business is based on ideas generated in their previous workplace (Klepper & Thompson, 2009). As our research has shown, small enterprises in the ICT sector show better performance when compared to small enterprises in other industries. The research conducted among the leading start-ups (Bhidé, 2000; Kaplan et al., 2005; Klepper & Thompson, 2009) showed that two features are essential for the success of a small enterprise. One is that it belongs to high-growth industries: software, semiconductors, lasers, biotechnology. The other is that the founders of a new small enterprise are highly-educated persons. A large number of them are reputable experts in a particular technical field with appropriate experience in management, quite often occupying senior positions. It is evident that ICT industries employ and require highly educated experts while opening up possibilities for entrepreneurial ventures and self-employment. Based on the conducted research, the following conclusions can be made: 1) industrial dynamics (entries, exits, enterprise mobility) affects the performance of the sector (the growth of the sector measured in terms of total revenue, profitability, productivity); 2) service industries, with respect to their performance, represent the engine of the ICT sector growth; 3) comparison of performances of companies pertaining to different categories indicates that medium and big enterprises are more successful than small enterprises; 4) the relation between the performance of the sector and dynamic features of the industry highlights the potential role of institutions and economic policy. The results of the research suggest that the role of regulation should be directed at creating circumstances that would encourage survival and growth of profitable enterprises while presenting a minimum hindrance to experimentation related to companies' market entries and exits. Possible areas in which institutions and legislation could be actively involved and have an impact on industrial dynamics (which in turn affects productivity, profitability and other aspects of economic performance) are: administrative barriers and barriers to entrepreneurship, availability of capital (level of capital market development), education system, freedom of exit out of the market (bankruptcy law and employee protection regulation). The availability of capital for new small enterprises is generally problematic due to the commonly risky character of projects involved and modest means that such companies have at their disposal. In Croatia there are no special funds for innovative projects intended for small enterprises. Moreover, the existing traditional ways of financing are hardly available considering the insufficiently developed capital market.

3.3 Implementation of ICT in small and medium enterprises

In a competitive environment, ICT, when used efficiently, can aid successful enterprises in increasing their market share at the expense of less productive enterprises. This can be achieved by increasing productivity. The increase in the usage of ICT is mainly motivated by a company's internal growth and restructuring (the growth of certain companies and a decline in the business activity of others). This is particularly true of young companies, some of which thrive and continue to grow, whereas the others cannot manage to survive in the market. Technological development, especially implementation of ICT, is beneficial for small-scale production, which was established in our research on static features of industries in the ICT sector in Croatia. Cheaper capital goods are becoming available, the minimum efficient scale is being reduced and flexible specialization is possible (Verheul et al., 2002). Nevertheless, although the usage of ICT enables a relatively easy entry of small and medium enterprises into the market and their expansion, big enterprises can also appear as competition in areas dominated by small and medium businesses. Research brings to attention problems related to adoption and usage of ICT in small and medium enterprises (Harindranath et al., 2008.). In an extremely competitive environment and under financial restrictions entrepreneurs fear problems related to technology obsolescence and long-term investment into external consultants and suppliers arising from the lack of one's own skills in using and assessing the potential of ICT investment. For small and medium enterprises the implementation and usage of ICT is by no means simple, as it presupposes complementary expenses related to training and organizational changes as well as the direct costs of investing into hardware and software (OECD, 2004). In their research into small and medium enterprises in the USA, Wymer and Regan (2005) identified factors that impact on the adoption and usage of ICT. Some of these factors are related to technology, whereas the other part belongs to business activity (external and internal factors – internal knowledge and expertise, financing). Rashid (2001) proposes four categories of factors that affect the ICT adoption: technological (relative advantage, complexity, compatibility, cost), environmental (competition, supplier/buyer pressure, public policy), organizational (size, quality of systems, information intensity, specialization) and individual factors (managers' innovativeness and knowledge). Yet costs and financing of material factors are clearly only one dimension of the problem. The other concerns the complementariness with other factors, primarily the human factor – managers-owners and employees. Arendt (2008) presents the results of the research into barriers to ICT adoption in SMEs comparing selected regions in Spain, Portugal and Poland with a similar research conducted in the USA. According to his research, the major issue is not the access to ICT but rather the lack of appropriate education, knowledge and skills on the part of managers and employees. It is evident that small and medium enterprises suffer from the problem of a lack of human resources needed for using ICT. Their occupation with numerous operational and financing problems prevents them from making the assessment of benefits of using ICT one of their priorities. Research conducted among small enterprises with 3-80 employees reveals that the adoption of the Internet depends on the existence of technology-savvy employees (Mehrtens et al., 2001). It is not necessary that such persons are ICT professionals. Instead, their interest in technology is crucial. This is reminiscent of the problem highlighted in the passage on the impact of ICT on labour market; namely, there is no doubt that the demand for ICT experts as well as for individuals inclined toward using the new technologies will persist. The higher the number of ICT users and ICT producers, as well as of individual users, the higher the possibility of spillovers. There are two conditions that determine spillovers or external

economies. The first condition is the interdependence of economic subjects, whereas the second condition is a lack of market compensation for the effect caused by one of the subjects on another. Producer-related spillovers arise from easier diffusion of production knowledge within certain spatial limits or institutional frameworks. User related spillovers refer to positive externalities arising from the implementation of certain products and services. ICT spillover effects have been recognized in theory although empirical research on that topic is scarce. This may result from the fact that spillovers are difficult to measure and their long-term effects have to be examined.

4. Conclusion

This review, based on the extensive literature on the impact of ICT on economy, encompasses both theoretical foundations and empirical research in the field. It was our goal to bring to attention certain elements that may be particularly relevant in determining the path of the development of national economies and regions. The review also focuses on issues that deserve particular attention by institutions responsible for passing measures concerning development support. The part dealing with the microeconomic domain presents the research into the contribution of the ICT sector to Croatian economy by using statistical methods. In our research on the microdynamic processes in ICT industries we used the tools for industrial demography analysis. We noticed the benefits of the impact of the ICT sector: more rapid growth and above-average performance in comparison to other industries, opening up of new entrepreneurial opportunities owing to a lack of sunk costs in service industries (that is, exploration instead of exploitation). Strong spatial concentration of ICT industries suggests potential transformation of regions through ICT industries and ICT entrepreneurship. Future research should aim to identify the way ICT are being used to improve local and regional economic efficiency, innovation and entrepreneurship. Nevertheless, at this point we should take into consideration that, although theory is more inclined toward researching dynamic industries, in practice we should depart from the evident differences among regions in terms of resources and tradition of economic activity. In that sense the potential role of ICT should be highlighted again, as even less attractive industries that are implementing ICT and complementary innovations and changes can become attractive. In all research the importance of human capital and high potential of ICT services is notable. This could provide the less developed countries with an opportunity to converge with their developed counterparts, provided they exploit their human potential by investing into education. ICT industries are by no means immune to business cycles, which explains the decrease in activity and employment shown by statistics. Nevertheless, recession can be considered as a "filtering period" in which restructuring occurs at relatively lower costs, although the social dimension of the problem manifested in the loss of the existing jobs or inability of creating new ones should not be disregarded. Research into enterprise survival indicates an increase in exit rates (with the majority of unsuccessful companies very likely to experience collapse) that discourage potential entrants. As economic experts, we believe that the role of ICT should not be mystified, although we are aware of the profound and far-reaching economic and social changes introduced by them. Instead of focusing on short-term effects, it is necessary to consider how the described phenomena will evolve in the long run, which is the approach commonly practiced in economics. Although it is very hard to differentiate "short-run" from "long-run", we are certain that in the long run everything is subject to change. From the perspective of

digitization of economy, taking into consideration time and space (which indicate huge differences between the developed and the undeveloped), it is evident that this process is analogous to transition. In ensuring that the world is not reduced to polarization of winners and losers, that is, to the winner–take-all-races landscape, the role of institutions should be highlighted. It is through them that a more even distribution of knowledge, skills and income should be achieved.

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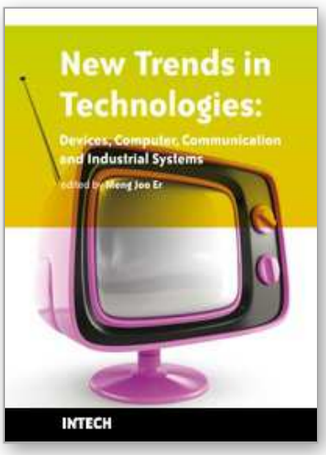
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