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NEW TECHNOLOGIES, BUSINESS CYCLES - CONTROVERSIES AND PARADOXES

Abstract

Debates over the business cycle in the economic theory have been continuously carried out. Some have, but others have not adopted tricyclic, or multicyclic scheme because so far they have not or even have been convinced by the Kondratiev's theoretical analysis and Schumpeter's historical analysis, but numerous statistical analysis of the US National Bureau of Economic Research, so frequently used in this field, and especially in Mitchell, Barnes, Torpa, Hansen and others confirm the thesis of the need for further research continuity. The world economy goes through "a tectonic shift" and through the deluge and booms of transformation. The new technologies and globalization change the world. Technology will (which was considered to be a residual factor by economists for years) rather than the market affect the direction and pace of economic development. The question is: Can the cycles be predicted and planned as such and can their formation be prevented? Who and what are the causes and how to successfully master them while they last?

Keywords: *new technologies, business cycles, innovative activities*

1 INTRODUCTION

Development of economy as a whole system, nowadays, contradicts some elements of developmental strategy, which lean towards corporate economies containing elements of discretion in terms of the goals that are set. Do these shifts reveal the new needs to study questionable theories of modern economy, especially in terms of their importance, function and duration? The very act of creation of crises, which are most often the result of development discontinuity as well as the other disorders in the functioning of economies and their partial complexes, indicates the ways of functioning of certain laws both in terms of stability and from position of devaluation.

Globalization movement, which tends to present the world economy as a single system, is likely to contribute to the globalization cycle in the future as well. Instead of multiple types of cycles, some economic theorists, from the aspect of duration, also define the so-called medium cycle. This type of cycle is the end result of a special operation of the law of capital accumulation, or the result of a certain class of division of national income on accumulation funds and the personal consumption of population, as well as on movement of new investments that aim for maximum profit, and which, as a conseaquence, has a constant disparity of faster increase in the respective composition of capital.None of the existing civil theories of business cycles, taken as a whole, is satisfactory. The solution is not to, from the all existing

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theories of business cycles and their happy combination, get a new theory that would tend to have the highest accuracy and complexity, but above all that, starting from a good base, would only take those elements which, involved in the whole, would give a logically linked and elaborate theory of cyclic movements of individual and overall world economy. The question of technical and technological breakthroughs and prosperous future is particularly stressed.

There are, in essence, two approaches. Some theorists approach the problem of cycle and cyclic movement from the position of the capitalist mode of production, contained in the method of its accumulation and expanded reproduction, while the others seek an explanation for particular types of cycles in purely exogenous factors (Todosijević and Lazović, 2010).

Long cycles are explained with large changes in production techniques, which have emerged as a result of epochal discovery (Schumpeter, Spithof), preparing for war and by making wars such as the Napoleonic Wars, the American Civil War, the First and the Second World War, production of gold as money and similar.

Cyclic movement of the world economy has its causes in the economy itself, in its method of accumulation and expanded reproduction, primarily due to the impact of endogenous factors, while external factors can only emphasize and mitigate their effects, but cannot significantly alter economic flow.

The crisis of 2009 was interdependent because when it emerged in one economy (the US) it transferred with an exceptional speed and reflected on the functioning of other developed economies such as the EU, China and Japan economies, but the economic systems of underdeveloped countries were also affected, although to a lesser extent. Countries in transition, being short sighted, were unable to predict the emergence of this crisis, and consequently did not create a defence mechanism for what was coming. By studying long cycles and statistical probability of their appearance we could foresee the crisis and prepare defensive mechanisms to mitigate its effects and consequences.

Time and changes received the proper place in the system of economic thought only after 1990s. Politics, economics and value standards change cyclically and tend to be in a state of equilibrium.

2 CYCLES

Changes that occur in economy arise periodically, have characteristics of a cycle, in economics are treated as a cyclic change and are seen as a fluctuation that is repeated at the same time in many economic series with periodicity ranging from one to 50 years. This movement consists of four phases (Todosijević and Lazović, 2010). The main characteristic of this type of change is its periodicity. Duration of the entire cyclic movement or a cyclic phase is different from cycle to cycle. The entire economy is characterized by cyclic variations and passing through four stages, which, essentially, has the characteristics of cyclic fluctuations. They are characteristic for the development of capitalist economy, but can also be observed in regulatory economies where their nature is different. The cycle in economy is often defined as a period of time from one crisis to another - from one of the lower points to the other, in which there are repetitive changes in the movement and development of economy and its structure. The crisis is a culmination point in the cyclic movement of economy and appears as a culmination of disorder that manifests itself primarily in economy, and then in other spheres of social life. There are certain connections between the trend and the cycle. When the trend becomes an eliminated form of the remaining cyclic fluctuations, it is in fact partly determined by the same forces of the trend. Elimination of trend can be considered as a mechanical method of presenting the influence of trend on the cycle.This relationship between the cycle

and trend leads to consideration the long-term aspects of changes that, to a certain extent, give an idea for discussion about cycles. In the behavior of economy, there may occur a model of change that has the characteristic of stable equilibrium position. Its characteristic is in the dynamic expression that has the feature of scientific stability, which can be characterized as a stationary state in which there are changes, but no growth.

If we can present that a cycle exists in the absence of growth, it is acceptable to explore whether further growth can exist without cycles. If it is possible, then we should see economic cycles as a break in the growth process which can be controlled, rather than see a cycle as a necessary precondition for the growth process. Factors such as population growth, changes in technology, changes in consumption habits, and the greater scope of government activity in economy, may alter the model of fundamental cyclic fluctuations. In this way, when summarizing a retrospective of events, a conclusion is drawn that growth occurs as a product of changed cyclic behaviour and consideration of the presence of a cycle in the absence of growth, while growth without a cycle is essentially not possible.

There is no absolute progression without relative regression (Todosijević, 2010). Although this attitude is fundamental, the growth comes through cyclic experience. We can consider models that locate economy in the model of continuous upward movement, which reverses the position. There is a correct model, but the question is how to sustain it. It has been proved that both approaches are directed toward the same goal, although they may be described differently. If the model can achieve growth without cycles, then a tendency to correct any deviations from them is set as a goal, and thus we return to the main track. If the experience is cyclic, the aim is to control the amplitude so as to obtain the net result of growth. In the first situation, growth is observed without the cycle, and in the second, growth is the net result of cycle.

The newer approaches place the macro model on optimizing target function in an electronic environment which is characterized by perfect competition, and in which all markets adapt without causing costs (Joksimović, 1984). Is this the time of digital Darvinism? It is a dynamic economic system in which rational approach enables subjects to act on the basis of established expectations, as if they were fully informed about the structure and economy, which is why the expected values are different from the actual values of variables, only as a result of serial non-correlated random errors. The subjects appear to be fully informed about the structure of the economy, and make mistakes only as a result of random exogenous shocks through policy of surprises, or, as it stands out in the later development of the new classics, due to random fluctuations in the technology which is seen as a "real shock" (Praščević, 2008).

There are three main hypotheses on which the new classical macroeconomics is based and which are particularly important for the explanation of cyclic fluctuations:

1. The hypothesis of rational expectations,
2. The hypothesis of continuous market cleaning,
3. The hypothesis of aggregate supply (Snowdon, 1997).

The hypothesis of rational expectations is integrated into the model which includes market cleaning and the natural rate hypothesis. In the further development of the macroeconomic theory, the key difference between the new classic and Keynesian response, through the new Keynesian economics, was just in the disagreement on the issue of accepting the Walrasian structure frame of economic model, i.e. the existence of simultaneous, continuous balancing of market (The hypothesis on rational expectations has also been accepted by the new

Keynesians). Two analytical bases: the aggregate supply curve and hypothesis of rational expectations define the new classical macroeconomics. The idea of rational expectations attracts more attention, but its use of the version of aggregate supply curve makes the most fundamental innovation of the new classical macro-economics. The Keynesian economics (including its monetarist variant) may include rational expectations, but cannot be complemented with the universal existence of competitive markets that are continuously cleaned with flexible prices, which is the *sine qua non* of the aggregate supply curve (Laider, 1997).

The new classical macroeconomics insists on optimizing behaviour of individuals and coherent microeconomic fundamentals, thereby contributing to establishment the neo-Walrasian research programme in macroeconomics. The characteristics of this program would be the following:

1. existence of economic subjects
2. subjects have preferences regarding the results,
3. subjects independently optimize their target functions,
4. selections are made on the interconnected markets,
5. subjects fully own relative knowledge,
6. observed economic results are coordinated and must be considered in relation to the equilibrium states (Backhouse, 1996).

We come to the fact that the new classical macroeconomics faced the problem of existence the business cycles when they tried to apply the aggregate supply function to the data on real economic criteria (Lucas' function-Changes in policy instruments, will lead to changes in the parameters of the model, either in a soothing effect policy or making its effects unpredictable). This criticism is closely linked to the rational expectations in the neoclassical macroeconomics.

Information indicating the existence of fluctuations relate essentially to the business cycles, and then the important assumption on which the new classic is based, and its conclusions are called into question, because the function of aggregate supply does not correspond to the real economic developments. According to this function, the real product conforms to its natural level, and any deviations from that level are temporary, and result from the surprises of economic subjects.

Disturbances at the level of economic aggregates do not refer to a period, but it is the existence of several successive periods in which the product departs from its natural level both upwards and downwards and therefore unemployment and other economic aggregates are characterized by the same behaviour. This fact raises the question of explaining the problem of stability for the new classics: How to explain the serial correlated movements of economic aggregates? The theory of the new approaches is based on the assumption of current, simultaneous cleaning of all markets in the economy, which is related to Walrasian overall balance as a framework for the analysis of trends in economy (Walras and Schumpeter, 1954). Real economic developments, which had a cyclic character, ask for the explanation and answer to the question of whether the cycles are deviations from equilibrium, or they are just imbalances in economy. New approaches do not accept the explanation of the imbalances that characterize the economy in other periods. This led to a confrontation with the extremely complex task of providing the necessary explanations of cyclic movements as the constituent elements of economic balance, offering a model of equilibrium business cycle.

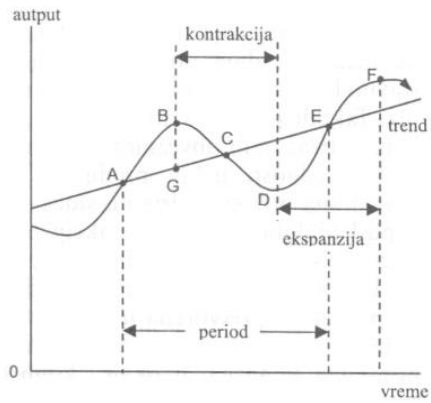
The traditional view of equilibrium includes two approaches: the first approach is operational in character and there balance and imbalance are understood as equality or inequality of two groups of size - economic variables, with no analytical approach to the problem that would enable clarification of the nature of the relationship (income and expenditure budget, import and export, etc.).

Another approach is based on treating the concept of equilibrium as a methodological tool of abstract economic theory. Here the phenomenon of equilibrium is used in conjunction with the models that have mutual relationships between the economic variables. The traditional view of equilibrium in economic theory is generally defined as a relationship of economic variables that are adapted so that there is no inherent tendency for changes in the relationship of the model that they form.The traditional treatment of equilibrium specifies the conditions of equilibrium depending on whether it is a short, medium and long term period of time (Marshall's distinction between the current, short-term and long-term market equilibrium). There are also other distinctions of equilibrium.

Schumpeter talked about partial, aggregate and general equilibrium. Under partial equilibrium, he saw the equilibrium of enterprises or industries, under the aggregate equilibrium between certain aggregate quantities selected depending on the analysis that is preferred to be performed and under general equilibrium – he saw the equilibrium of the national economy. Dynamic understanding of general equilibrium is the subject to constant evolution, and consequently has continuously pursued correction. Starting from the general theory of (economic) system, equilibrium is the lowest form of the system organization in the hierarchy: optimality - stability - equilibrium. The first significant theoretical correction of understanding the general equilibrium emerged with appearance the Keynes's theory of general equilibrium with full employment of the all factors of production. This reformulation of general equilibrium is reflected in the fact that at that time a big step was made towards defining the economic stability as a higher form of organization of the economic system. The equilibrium is no longer interpreted as the ultimate goal of economic system, but as a necessary precondition of its stability.

3 TYPES OF BUSINESS CYCLES

National income is the basis for expressing and analyzing all fluctuations in economic activity, and they can be recognized as an economic, trade or business cycle. The regular model represents an expansion of activities, followed by a contraction and then again by a new expansion (Pierce and MacMillan, 2003). This cycle occurs around a secular or long-term trend of output in the form of a curve that reflects current paths of output, with the peak at point "B" and "F" and the bottom at point "D", presented in the following diagram.



Privredni/trgovinski ciklus

Figure 1 *Economic/Trade cycles*

The time between any two points in the cycle phase represents a cycle period as from "A" to "E" or "B" to "F". The amplitude of the cycle is given between the top and trend line, or between the bottom and trend line (Pierce and MacMillan, 2003). The theory of business cycles is associated with Hicks, Schumpeter, Metzeler, Goodwin, Kondratiev ... Since the mid-19th century, when Zuglar definitively established the existence of wave movements that pervade life within the institutional set of the capitalist economic environment, working on research, networking and measuring relevant facts has constantly been progressing. It was found long ago that there is only one type of business cycles. Some are general, some sectoral, they occur simultaneously and superimpose on each other, which leads to the irregular periodicity of general economic trends. We recognize the Zuglar's cycle as a trading cycle of economic activity that lasts for a period of nine to ten years (C. Juglar, (1819-1905), a French economist who is said to have claimed to be the first one to recognize "wavy" movements in economic activity). He divided the cycle into three periods of prosperity, crisis and liquidation and emphasized the importance of bank loans to the development of crisis.

Schumpeter proposed the tricyclic scheme: long cycles that last 54 to 60 years; cycles of medium length of 9 - 10 years and short cycles that are 40 months long (Schumpeter, 1939). He named these cycles after the economists who first described them, and whose terminology later entered the literature. He linked them in such a way that the shorter cycles are included in long ones and grow into their phase part. The Long Cycle of Kondratiev contains six medium cycles. The Juglar's cycle contains three short Kiciniev's cycles. Statistical research shows the existence of 20 year long cycles, which are usually associated with long-term conjecture in housing construction. Then, shorter housing, or construction cycles were identified. A whole series of spider web type cycles is determined in agriculture: the pork cycle, the cattle cycle, the cycle of coffee, etc. Nowadays, the understanding that the capitalist economy is immune to the cycles, because the contemporary bourgeois theorists attach extremely a great importance to this issue that is seen as wrong. We have a large number of papers on the theory of business cycles, but also in the field of anti cyclic policy.

The question that arises is whether government intervention succeeds completely in eleminating the cyclic movement or not, and whether under the influence of government intervention may be more correct to speak of a cyclic form of movement, with a clearly expressed periodicity and the existence of all four phases of the cycle, or else the cyclic movement, in large modifications and deformations, is expressed in that regularity? Regardless of the disclaims in terms of regularity of manifestation, there is no denying that, in addition to various types of short-term and long-term fluctuations, movements and disorders in economic life, there are also typical business cycles, which are not a pathological disease, but a characteristic inherent to private enterprises and market economy (Hansen and Schumpeter, 1951). They represent the most typical, and of all possible ones, the most unique form of movement in the capitalist economy.

4 ANALYSIS THE THEORY OF LONG CYCLES

Aleksander Helfand is one of the first authors in the history of industrial capitalism who drew attention to existence of long cycles. Dealing with the problems of the agrarian crisis he thought that the long depression that began in 1873 was soon to be replaced with a new long term verve. In order to conceptually include the long expansive waves that are accompanied by

the long wave of economic depression, he used the term "period of Sturm und Drang". He believed that the expansion of the world market is crucial for the explanation of this long-wave movement due to changes taking place in almost all spheres of the capitalist economy: in technology, trade, money market, in the colonies - and they place the total world production on a new and much wider base. He uses statistics, and his periodization of long waves will varied a lot from the one that other long-wave theorists gave later (according to him, the "Sturm und Drang period" began in the seventh decade of the nineteenth century and ended at the beginning of the eighth decade, while it is generally considered that there was a long wave of expansion of the crisis from 1847 to 1873).

After Helfand, in 1913, the Dutch Marxist J. Van Gelderen again raised the issue of long waves. Under the pseudonym J. Feder, he published three articles in which, on the one hand, he tried to provide empirical evidence on the existence of long waves, and on the other hand, to give a theoretical explanation of the same. Unlike Helfand, he attempts to explain the long waves through expansion of production. A precondition for emergence of a strong tide periodis expansion of production of consumer goods, which indirectly creates a new demand for other products, capital goods and raw materials (Van Gelderen, 1913). Such expansion may also be caused by expansion of the world market through colonization or new areas in the world economy, or by sudden creation the new expansive branches of production. In the present circumstances this would mean an expansive appearance on new markets, the so-called. countries in transition. Van Gelderen also discovered, independently of Kautsky (Kautzki, 1913) who formulated something similar on an exclusive wave, that a stage of a long cycle was preceded by extremely increased gold production (Similar views can be found a little later with Duprijez). The end of period of tide occurred because the escalation of production and trade cannot go beyond the point of saturation of the market in which highly developed capitalist countries export. This moment becomes faster through industrialization of importing countries and their overall development. Production of raw materials cannot keep up with the production of finished products. As for the periodization Van Gelderen makes difference between "the period of growth from 1850 to 1873, the period of decline from 1873 to 1895, and the period of growth from 1896 to the present (Van Gelderen, 1913).

The idea of long waves can be found with the Marxists. Kuznec mentions Lescure, Aftalion, Lenoir, Spiethoff, Cassel. It is primarily monetary theorists who emphasized the reduction of money supply in relation to demand from 1873 to 1896. According to Landes "this attitude got its most complete analytical character in the work of Simiad who gave an overview of events in the 19th century, and constructed a model of alternating inflationary and deflationary long trends. The first ones are characterized by a quantitative growth at a relatively stable technology base (analogous to what we call today the expansion of capital), and the second ones by qualitative improvement (capital deepening) and the forced liquidation of inefficient enterprises" (Landes, 1969).

We should add Wicksell to the Kuznec's list, who, before the end of the XIX century, also spoke of secular fluctuations in prices and interest rates, and then Pareto who in 1913 mentioned the long-term fluctuations.

Kondratiev, the former deputy minister for nutrition in the interim government Kerensky, was interested in this issue in 1919, and in 1920 he founded the Institute in Moscow, where he began collecting material for study of long cycles (Note that the Kondratiev probably did not read the Van Gelderen's study when he wrote his articles in the period from 1922 to 1928).

Trotsky, analyzing the postwar development of capitalism in comparison with the

development of pre 1914, also entered this complex issue. Simultaneously with Kondratiev, though independently of him, the Dutch Marcsist de Wolff tried, among other things, to statistically improve Van Gelder's analysis by calculating "decycled" numerical sequences (De Wolf, 1924). He follows the dynamics of prices and production of gold, but does not provide a satisfactory explanation of long waves, so his overall analysis is far behind Van Gelderen.

5 INVESTMENT CYCLES AND COMPREHENSIVE CHANGES BASED ON THE NEW TECHNOLOGIES

On the pedestal of power, making a decision to change appears as a dangerous precedent because of the inability to obtain materially confirmed signposts. If the success is maintained for a longer period of time and the bigger it is, the more difficult it would be to make changes because a dominant position can turn into decadent - into complacency. A strategy tracing a new path in conditions of a dominant position is more unknown to those who are in that position than to imitators and followers. Due to the impossibility of an adequate movement into the future, a need for creating a dynamic development strategy for evolutionary changes of the new era necessarily appeared. We found help for adequate response in a modification of the Newton's laws to changes. For analytical purposes, we carried out the minor linguistic modifications without skipping intuition in order to accomplish the process of adaptation to the phenomenon of change in organizations.

1. Law: the behavior of an organization cannot change if it is not affected by an external force.

Very few organizations face the need to make some significant internal changes without a significant degree of influence of external forces that operate in the region and to apply to them. If the success of the company is viewed through output value placement over time, then characteristics and quality of the output are not good. The reasons for their acceptance and active feedback operation can be found in the environment. Under the influence of the environment, there appears an internal response of a company to challenges coming from the outside.

2. Law: the amount of change in behavior will be directly proportional to the amount of effort that is entered into it. "The amount of effort" raises the question of efficiency of different types of effort, and while it is quite clear that a major change in strategy requires major changes in the sources of obligations, such a process is not automatically accompanied by the required changes in behaviour.

3. Law: resistance of an organization to change will be of the same value as the amount of attempts that went into its change but of opposite direction.

This law holds a change maker awake even at night (Davidson, 1995). The more homogeneous, more successful historically and more natural organization in its composition, the less "sleep" a change maker can expect. The stronger the culture, the stronger the thrust. If you cannot find any way to channel external resistance, it results in stalemate. If change makers are few and are the only expression of external forces (Act 1), then their chances of making significant decisions are small. No one owns a winning recipe for the synthesis, but more interaction is needed between functions and not only that it goes with each of them but it also determines the success of the whole system. With a better operation of each function, the process of approaching the success of the whole is greater.

The characteristic thinking of the modern economic thinkers reduces to the following:

1. A few brave ones look forward to a new era of prospects and prosperity, and

2. Majority of them foresee a form of economic final battle.

The world is increasingly concerned about the growing unemployment and stagnant wages. The alleged cause of that are globalization and amazingly the rapid technological changes (The Economist, 1996). Computers and robots, together with management techniques, destroy jobs !? At the same time, free trade and capital flows and enormous progress in telecommunications, increased international competition and made it easier to companies to transfer their production into developing counries with low wages. Many feel that the invisible hand of Adam Smith tries to push them off the cliff. There is a suspicion that the present government policies do not function anymore, because they are not suitable for a new global, digital economy (Lloyd and Thurow, 1980). The question that can generally be asked might be: does technological revolution require economic revolution? Modern processes are characterized by the pace of technological change, which defines the contemporary trends in capital movement, as we are the witnesses of its internationalization. The views of political economy that the owners do not have the real power of equity, but those who manage capital will be confirmed. The quality of output will primarily depend on the quality of decisions and management skills, on the degree of implementation and transformation of inputs, including information. By lowering the cost of communications, technology fuelled the globalization of production and financial markets (Todosijević, 2010). In return, the globalization encourages technology by intensifying competition and accelerating the diffusion of technology through foreign direct investment. Josifidis K. would answer to a multitude of terms with only one question: "Is globalization a process, a trend, a project, a myth, a cultural pattern, a way of organization, a strategy, everyday life, viewed separately or all these at the same time?" (Josifidis, 2008). Together, it will be proved that information technologies and globalization more efficiently overcome time and space. Over the last twenty-five years, a global network of computers, phones, TVs and other electronic devices used for business and fun, increased its capacity to convey information by 1.3 million times. Computer power doubles about every 18 months in accordance with Moore's Law (Gordon Moore, co-founder of the US Intel).

Today's computer is much more powerful than computers in mid-1970. 30 years ago the whole world has about 50,000 computers. Today, the number has increased to about 1.5 billion, but still with unequal distribution. Chips embedded in cars, washing machines, dishwashesr, talking postcards, protective systems, aerospace and others are not included here. A typical car today has more computing power than the first vehicle launched to the moon in 1969 (The Economist, 1996).

Is it possible to compare the level of technical modernity and the quality of output, or should it always be seen in the context of time when changes or some specific techno-economic domination happened? A good number of economies of different countries opened their markets for trade and capital. Is it their way into deeper poverty? The developed progress at a faster pace and with greater intensity, because they can put more scientific, technical and material resources into service. The tendencies in capital movement are feasible as forecasts.

Information technologies today represent the engine of growth and prosperity. Ethan Kapstein in the Foreign Affairs states that "rapid technical change and sharper international competition weaken the labor market of major industrial countries ..."

The new technologies certainly suggest a different industrial revolution, but understanding and mastering this revolution does not require a revolution in economic science. However, the scope of both globalization and information technologies has greatly increased. By some measures, the economies at the beginning of this century were as open, and integrated as they are

today. Trade of the majority of industrial countries, as a share of GDP, is not much higher now than it was a century ago. While the capital definitely has become much more mobile in recent decades, the net capital flows between countries were, in fact, bigger in relation to GDP at the end of XIX century. At that time Britain invested abroad more than 40% of its savings (The Economist, 1996).

Perhaps the railways, steamships and the first transatlantic submarine telegraph cable in 1860 were far more revolutionary than lasers, satellites, the Internet and other digital magic. What is different is that globalization in the nineteenth century was encouraged by falling transport costs, while globalization is now encouraged by "tumbling" communication costs. Cheap communication networks allow companies to locate different parts of their production process in various countries and also be in close contact with them. It is difficult to measure the influence of globalization and new technologies on the output because conventional economic statistics, being projected for the industrial age, are not up to the information age. We point out that there is no reasoned justification for the apocalyptic prophecy of rising unemployment, because the total information society will, like any other technological revolution before that, create at least as many jobs as it destroys in total. The new jobs would be better paid than the old ones. Many tasks will be executed according to the predefined software, so management and control functions will be increasingly prominent, compared to the immediate execution functions that would be manifested by operations through mechanical approach.

Changes and innovations has lead to fear incitement and uncertainty, due to the fact that changes are always destructive and sudden and that there is always someone who opposes to them. Nevertheless, the change is simply the economic growth under a different name (In 1820, three thirds of American workers cultivated land. Today that share is barely 3%. The others are much more productively employed in other sectors).

Steady growth of income and employment, which is based on the continuous shift of resources from declining industries to industries that are in the process of development, was described by J. Schumpeter as a "creative destruction" (This attitude of Schumpeter clearly confirms the views Gutenberg on dual effect of technical progress, which we pointed out earlier in this paper). Also, if the governments try to protect their companies and jobs from change through import tariffs, subsidies or the protection of employees, they will prevent not only changes but also economic growth.

Rapid technological changes in the long run are the main source of higher social standards for economy as a whole, regardless of the fact that the costs and benefits of technology and globalization are not evenly distributed. The economic theory has proved to be clear, multilateral and adaptable enough to provide answers for digital future and mechanical history.

5.1 New technologies- similarities and differences of earlier innovations

Innovation processes of products, production and organization are the main forces that stimulate economic growth and rise living standards. Economies have access to a limited amount of capital and labour (The first complex elaboration of the theory of limitation was found at Richard, from whom Marx took it and included in his scientific method. The starting point is that the degree of exploitation of certain types of resources can only be less than or equal to total available resources). Technical progress and competition have become the main growth incentives. Growth can only be maintained by finding the new and better ways of using the limited resources. With increasing levels of technologicality (scientific value) in work processes, as a rule,

limitation is not abolished, but the process of their permanent use in time is realized. As the process of development of productive forces objectively delimits possible and conditioned productivity, the development of productive forces equally leads to more cost-effective exploitation of available resources.

In the last two centuries, a real GDP per capita in developed countries has increased by about 1.6% per annum. At this rate the income per capita doubles every 44 years. Historically, such growth was the exception rather than the rule. The inability of precision does not inhibit the assessment that until 1800, for 13 centuries the real output per capita in Western Europe had slowly grown, on average by no more than 0.1 to 0.2% per annum (The Economist, 1996). According to that dynamics, living standards do not improve significantly over the life of the individual and real income is only doubled every 500 years. There were changes through the tempo of technological innovation (Todosijević, 2010). In the Middle Ages, several innovations such as windmills and horseshoes appeared, but technological progress was imperceptible in comparison with what happens today. From A. Smith to the present day, the economists have noted that technological change is important for long-term growth, but it has only become the subject of study in the last 35 years.

Labour and capital add knowledge and technological change to the model and eliminate paradoxical qualities. If we did not respect technological progress, the output growth would be condemned to be "zero" because the long-term investment rate has no effect on the growth rate of economy. Technological change is dominant by nature, because labour and capital can hardly contribute 50% to the total increase in output of the 20th century. This participation decreases with development of the nano technology, and there is an increase in knowledge, innovation and technology changes based on them. With his pioneering work in the mid-1980s, the economist Paul Romer of Stanford University (The Economist, 1996), directly incorporated technology into the models of economic growth.

Josifidis K. said: "It is important to note that a new knowledge in the Romero's model is the main determinant of long-term growth generated by the new investments in technology research which shows diminishing income" (Josifidis, 2008). It is not that the models of Harod Domar and Kalecki no longer apply, but they got a qualitative modification. The new ideas about more efficient processes and new products enable continuous growth.

5.2 Technological changes and employment

Throughout history, we have faced a lot of forecasts about the influence of machinery on employment. They are most often pessimistic in character with the statement that technological advancement through increase in level of technical equipment, work and technical modernity of production means will cause unemployment with a tendency to grow . At the beginning of the nineteenth century, the British workers broke machines for fear that they would jeopardize their existence. In 1930s people blamed automation. In 1940's, Norbert Weiner, a pioneer of computeristics, predicted that computers would create unemployment to such an extent that the great depression would look like a picnic (The Economist, 1996). Nowadays, the instigators of doom again predict the future without jobs because computers and robots will take them over. This, however, is not a human response to the human issues. The man is not to face the possibility of his own destruction. In his book “The End of Work”, Jeremy Rifkin, a technophobe, argues that 3 out of 4 jobs in America can be automated (Rifkin, 1998). His prognosis is that in the mid 21st century, hundreds of millions of workers will lose their jobs and be permanently unemployed. We ourselves are

the only ones who can confront everything around us, and how well we can do that depends on our abilities, knowledge and skills as well as on effective negentropy, and that is essentially the solution of the puzzle of the past, and the puzzle of the future.
The new technologies create at least as many new jobs, proportionally to the demographics, as they destroy.

5.3 The new waves of innovative activities - prognostic statements

Until the study of Romero, J. Schumpeter was one of a few economists who attempted to explain the growth mainly in terms of technological innovation, and interest in his theories has revived in recent years. In 1930s, he presented a model that assumed a growth through interaction, which consisted of a technological breakthrough and competition among firms. Schumpeter saw the capitalism as movement in long waves: approximately every 50 years technological revolutions cause "a storm of creative destruction" in which the old industries disappear, and are replaced with the new ones (As if there is an analogy with the cycles of nature. eg., every 50 years in the plains of America drought happens as an equal periodic phenomenon; or the Kepler's law according to which every 176 years, there is a lineup of planets in one direct line; or the Halley's Comet flight path...). This attitude is in correspondence with the laws of science development.

It is necessary to point out the modern history: the first long wave from 1780s to 1840s brought the steam energy that drove the industrial revolution; the second wave from 1840s to 1890s introduced the railways; the third wave from 1890s to 1930s produced electricity; the fourth wave of 1930s to 1980s was initiated with cheap oil and cars; the fifth big wave was triggered by information technology. Is a digital Darwinism imminent to the mankind? It is extraordinarily difficult to predict the consequences of the new technology. Pitfalls of the future are always mobile. Nathan Rosenberg in his speech at a conference on technology and growth states: the Western Union in 1876 refused to buy the Bell's telephone patent (Rosenberg, 1996). The company refused to offer an explanation "the appliance is inherently of no benefit to us (The Economist, 1996)."

In 1899, the head of the US Patent Office recommended that this office was abolished because "everything that can be invented has already been found". Thomas Watson in 1944, the then president of IBM, foresaw the world market for maybe five computers; he could not foresee any commercial opportunity for computers.

Information technologies won their anticipated part several times. Twenty years ago, much was said about the office without paper and cashless society to which new technologies would lead. Nevertheless, paper and cash are still used today – and paper is used even more than ever before.

Information technologies vary in type from earlier technologies and will therefore have very different economic consequences.

We are witnesses of vertiginous fall in price of IT equipment, which, in real scale, has fallen by 30% per year on average in recent decades. Will the prices be stabilized, or will the rapid penetration of nano technology lead to a further fall in prices and an increase in performance in terms of universal diffusion of these technologies? (Had cars developed at the same pace as microprocessors over the past two decades, a typical car would now cost less than 5 dollars and would exceed 250,000 miles with a single gallon of fuel). Falling prices are one of the best criteria for assessing speed of technological progress, which confirms the impression that the pace of technological change has accelerated (Todosijević, 2010). A rapid fall in prices leads to incentives to make more people buy computers, which allows the technology to expand much faster. Product cycles tell the same story about fast changes: 70% of the computer industry revenue comes from

products that did not even exist two years ago.

Tumbling down the costs of communication and transaction has a special advantage. Viber is free, Skype and VOIP make negligable costs. Thanks to the novelties, decline in costs is likely to accelerate. The massive and mass increase in transmission capacity and increased competition will certainly contribute significantly to this. There are forecasts that the marginal cost of telecommunications will fall somewhere near zero, both for the international and local calls (The question that regularly arises: Did not companies in the field of telecommunications convert fixed costs of technical capacity into variable and thus reach the enormous extra profit? In fact, the cost of telephone, fax or internet to send messages from Belgrade to New York is the same from the aspect of the technical system as between Belgrade and Ćuprija, or even closer, from one to the other destination in Belgrade).

Simon Forge, a member of the Cambridge Strategic Management Group, made a forecast which showed that in 2005 transatlantic video-phone call would cost only a few cents per hour. This forecast ignored the legality in development of science, ie. the tendency of transition from exponential into logistic growth, as well as economic principles of the product life cycle.

Knowledge is an important characteristic of information technologies as more and more knowledge can be codified: information, in the form of numbers, letters, pictures or voice may be reduced to digital form and stored in computers as a series of zeroes and ones. Codification makes it possible to spread knowledge faster, which should enable developing countries to use such knowledge in order to reduce the technological gap and try to catch up with the developed countries in terms of development. Codification of knowledge and low transmission costs also lead to easier sale of services, by eliminating the need for direct contact of producers and consumers, which, in fact, allows companies to locate different parts of their activities in different countries, to different destinations and to connect them with computer networks. The classic rules or laws of economic science in the field of location will be repealed.

6 LOST PARADOXES - OPTIMISM AS A WAKING FALSE HOPE OR PESSIMISM AS A REALISTIC EXPECTATION

Continuity of development cannot be bypassed, nor can it be achieved through sudden and abrupt growth and development, except in certain domains. Scientific progress and technical progress as the key drivers of intensification and increased efficiency are an integral part and the assumption of continuous development. Constant improvement of techniques and technologies and replacement of outdated technique with new productive models make an important direction of technical progress in production, and it is the role of investment and development policies. Development of machine tools production, electrical industry, microelectronics, computer technique, apparatus and instruments, and the entire IT industry is a prerequisite for improvement of machines that are included in technological processes, which will allow complex mechanization and automation of all stages of production. We emphasize this because of the fact that the level of technical modernity of production means, as a rule, is expressed through quality and service properties of a product. These two characteristics with other categories of marketing management, predominantly affect the level of competitiveness of output. In principle, the new technologies will cause huge fundamental changes, because some of the characteristics of progressive technologies are: the small number of operations, continuity, lower consumptions of resources and so on. Creating materials with pre-defined pro-

perties, i.e. with progressive, constructive, synthetic, compositional, super pure and other properties will represent the implementation of progressive technologies. Chemization of production becomes an important direction which requires accelerated development of branches of chemical industry. Technical development of energy complex would mean a qualitative advance in energy balance and the quality of production and supply. Radical shifts will happen in the agro-industrial complex, due to the impact of technical progress, on the one hand and, environmental standards, on the other. The new varietes will appear and they will be stimulated with the industrial activities whose characteristics will be enormously high yields and perhaps genetic modification. Productivity in agriculture will gradually approach the industrial productivity and then there will not be any subsidies.

The developing and underdeveloped countries are in a colonial situation as regards productivity, not only in the primary, but also in the secondary and tertiary sector. The driving force of development, business strengthening and innovative breakthrough, as a rule, lies in technological changes, particularly where there is a growing discontinuity. Development and innovative processes are in the function of strengthening competitive power, and are intended to indicate the direction of stocks and dynamics of development. The results of these efforts are manifested in programming development of products, processes and technologies (Todosijević, 2014). We will particularly accentuate branches and businesses with dynamic development where scientific and technical progress is intense. This is due to the fact that the total amount of knowledge, available in one area, is the starting point of innovation and development process. For the forecasts of development process, and a competitive position of products and technologies, and general business conduct of companies, it is essential that in the pool of available knowledge there is a continous inflow of the new knowledge in order not to devalue the current efferts directed at the future.

Why is there no certainty of likely future for the countries in transition? Due to a slow capital turnover? Due to binding of significant resources for investing for a longer period of time? Due to the impossibility of adequate anticipation of technological progress? Due to the danger of premature devaluation in technical and technological sense! Because the concept of investment requires consideration of dominant solutions at the level of world achievements in technics and technology, in order to avoid devaluation, before the period in which it is possible to perform reproduction. The proof: for a power plant you need 32 months, 5 years for a chemical plant, 2 years for a gas plant, from 1 to 3.5 years for manufacturing industry capacities based on reproducing the raw materials of agricultural origin, and so on. The lifetime of production now is from 5 to 7 years in the scientific industries, in young non-traditional branches 10 months to 3 years, while in the information technology every 18 months there is devaluation based on the operation of scientific and technical progress. Due to this or other reasons, the economists and governments of developing countries have become more cautious in their attitude about visible benefits of this strategy of (re)industrialization. The Russian Academy of Sciences is redefining the role of the state in economic development, while the United States have never abandoned that role. Removing territorial obstacles from the circulation of resources is, in fact, a precondition for creation the financial market in general and deciding on investments.

What is possible for developing countries? It is possible to reconstruct the large technical systems with an emphasis on specialization and previously preassumed cooperation. It is possible to rationalize and revitalize the existing industrial capacity. Modernization in relation to technical and

technological achievements and behaviour of competition is possible. It is possible to operate innovatively in various ways. The new measures of economic policy and a new policy of regional development are possible (Todosijević and Lazović, 2010). It is possible to identify the comparative advantages of managing certain types of resources, and to have the ability of effort disposition, which together correspond to the structure, quality and goals of development strategy. We need development without determination of location. We need a new approach to location according to which development of capacities is implemented in centres that have a lot of workforce, in centres that are rich in raw materials, in centres of consumption and the communication centres. This approach defines the future aspect of comprehensive development and tends to optimal weight dispersion of industrial and supporting service capacities. This includes, among other things, the overall urban and demographic development. The central problems of economy of the future are identified, and they are focused on the following areas: finding th new and cheaper sources of energy; finding the new and cheaper sources of raw materials; and high-level and economy efficient production of means of labour.

Another paradox shows that despite the investment in IT sector, there has been a lag in labour productivity, after which Robert Solow, a Nobel Prize economist, noted that "you can see computers everywhere except in the productivity statistics" !? The growth can be explained by higher input of labour and capital as well as by the fact that the contribution of technological progress was minimal.

The obvious lack of incentives in the new technologies among economists is known as the paradox of productivity. Paul Krugman, an economist at MIT, argues that the recent technological progress is not in the same league with the progress achieved at the beginning of the 20th century. Investments in a new technology are not necessarily aimed at stimulating productivity. The OECD study "Technology, Productivity and Jobs", emphasizes that an increasing share of costs for research, development and information technology is essentially devoted to product differentiation and marketing in the battle for market share, and not to making the existing production more efficient.

A historical explanation of this paradox is possible in a sense that there is a delay of several decades before the technological breakthrough can bring productive benefits (Todosijević, R., in "Prognostics", Savremena administracija, Belgrade 1983 states "The reseracrh of Giffilan confirms this historical analogy starting with a photo for which 112 years had to pass since the discovery, to the mass application from radio, television, the atomic bomb, up until Mazer, the mass application of which took only a week. However, the time from an idea to the mass use is getting increasingly shorter, but the legality of the rules in the form of equity neither exists nor is possible. The level of knowledge in one field and level of complexity of research outputs confirm this beyond doubt "). The wide spread of the new technology, not its discovery, is what brings the highest profit (Todosijević, 2010).

Paul David explained in his study (David, 1990) that in early 1880s introduction of the electric dynamo was manifested through productivity.

Another paradox is that three thirds of all investments in information technology were invested in service sectors such as telecommunications and financial services. However, owing to falling prices, computers are faster spread in economy than it was the case with other innovations throughout history. Some studies show that only when the diffusion rate is over 50% the productivity gain is possible. Research at the company level carried out by Erik Brynjolfsson and Lorin Hitt from the MIT in one study (Brynjolfsson and Hitt, 1994)

that examined 367 major US manufacturing and service companies between 1988 and 1992 found that the investment in computers gave an average gain of more than 50% annually.

It is hard to conceive, but no improvement will be found in the official statistics. Replaceable steel production technologies are an example of this. The method, volume of production and degree of alloying, i.e. the degree of quality depend on them. Coking, blowing oxygen or electrical methods, provide different quality of output. Whether we express that quality by natural or value indicators, although the price may have a declining tendency, the synthetic expression does not show that.

According to Zvi Griliches the measurement problem is a twofold: Firstly, economies move towards services that are always difficult to measure and secondly, the nature of the gain from modern technologies is difficult to quantify (Zvi Griliches, 1994) It is possible to conclude that the increase is under the influence of the new technologies, and that it is in essence respectable.

7 CONCLUSIONS AND MESSAGES

Man's greatness lies in his liberation from fate. He himself is the only one who can confront the whole entropy of his psyche and how well he can do that depends on his knowledge, skills as well as effective negentropy, and that is essentially the solution of the puzzle of the past and the puzzle of the future. During the last two centuries the enormous technological progress, employment and real income in rich industrial countries, and in those where the investment activity was carried out, continuously grew. The number of jobs and living standard has increased due to technological change, and not in spite of it. The unscientific approach of technophobes has no basis in relation to the future. The following questions may be asked: more or less science? more or less technology? The answer is very clear: more science and more technology, because it is the only way for humanity to get rid of fate, through control, and to be an autonomous creator of its own values that will last continuously.

Increasing levels of technologicality leads to the opening space for filling gaps and detection of new jobs in the sphere of management (planning, organizing, leadership, motivation), preparation and control as a corrective action in company management instead of in direct production. Technology will lead to changes in types of jobs and types of occupation. The lesser the resistance to change, the lesser are disorders in functioning of tangible systems; cycles and crises will last shorter, new jobs will be created and perhaps the relevant long term continuity can be preserved.

Opponents of new technologies have misconceptions, because, ad acta, there is an idea of a fixed amount of output. The technology will encourage both outputs and new demand. Theoretical items prove to be right, because the US and Japanese economies as the biggest users of computer technologies in production are exactly the best on jobs market. There is no room for futurephobia and dark apocalyptic looking toward the future. Here is the proof. From 1980 to 2000, the total employment level in the US grew by 24% in Japan by 17% in the EU by less than 2%. It shows that the new technology is good, not bad, at least in terms of new jobs. It is more difficult to assess the impact of information technology on services, but the OECD found that in the 1980s the fastest growth of jobs was seen in the countries that invested most in the Information Technology. All social and economic processes are far from being automatic, nor can they be spontaneous. They can be programmed but must be controlled. With this philosophical approach we can annul the possible time distance, and duration of the performance cycle. The speed of developmental and technological response is likely to decrease the potential discontinuities, and reduce them to a permissable extent.

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