

*Nataša N. STANOJEVIĆ\**

Institute of International Politics and Economics, Belgrade

## THE CONTEMPORARY PROCESSES IN THE GLOBAL ECONOMY AND METHODOLOGY OF ECONOMIC SCIENCES<sup>1</sup>

*Abstract:* The paper explores the shortcomings of the fundamental assumptions of economic methodology and the limitations of their application due to the modern processes that have led to radical changes in the very foundations of the world economy. The focus of the research is the incompatibility of the methods of positive economic science with the goals of applied economics. The general hypothesis is: *If the fundamental postulates of positive economics are applied consistently, without including actual, especially radical changes in the functioning of the modern world economy, their reliability and precision are significantly reduced.* The paper has two key parts that relate to the two most critical contemporary processes that pose new challenges to economic methodology in the world economy. The first is the impact of technological development, which leads to an increase in the unexplained values of economic growth in classical econometric models. The second analyzed process is the economic globalization that has placed global value chains (GVCs) at the centre of international business. The increase in the volume of international trade within GVCs has led to distortions of statistical data on trade and the devaluation of fundamental research results. The results showed that fundamental research can still be important for economic policies, but with continuous monitoring of real processes and their inclusion in basic methods, either by including new factors, corrections of input data or models.

*Key words:* economic methodology, economic growth, international trade, globalization, technological progress, economic policies.

### 1. INTRODUCTION

From the emergence of economics as a separate scientific discipline or rather as a skill, until the 1970s, economists' most important task and goal was to provide guidance and advice to economic policymakers. This primarily referred

---

\* Research fellow and full professor, [natasa.stanojevic@diplomacz.bg.ac.rs](mailto:natasa.stanojevic@diplomacz.bg.ac.rs)

1 The paper presents findings of a study developed as a part of the research project „Serbia and challenges in international relations in 2022,” financed by the Ministry of Education, Science, and Technological Development of the Republic of Serbia, and conducted by Institute of International Politics and Economics, Belgrade.

to forecasts of economic trends (prices of key goods on the world market, domestic and international supply and demand). The role of an economist involved the mastery of relatively simple skills and techniques, most of which are still in use today. The goal of economics set in this way did not support the development of the methodology of economic sciences as a separate discipline. Therefore, before the 1970s, the literature on economic methodology was limited to a few classic treatises and short methodological statements. In these early stages, the formal separation of applied economics from fundamental (positive) economics, which refers mainly to quantitative methods, was of little importance and probably impossible, as general theories were developed *from* specific applications.

The development of the idea of the possibility of fundamental research led during the 1980s to a sudden expansion of the literature on economic methodology. In ten years, more than thirty monographs appeared, as many textbooks, and three journals, which specialized in whole or in part in economic methodology, were founded. The number of articles and books on economic methodology continued to increase, as well as the coverage of analyzed areas, so this can be considered the period when the foundations of methodology as an independent discipline within economic science were laid.

With the expansion of economics as a science and the demands placed on academic economists, the need to make a more apparent distinction between fundamental research in positive economics and applied economics grew over time. Consensus on many general economic topics became widespread, and these general insights were transposed into formal models. Similar to the natural sciences, models in the field of economics represent a simplified version of reality. In form, empirical economic models usually consist of a set of mathematical equations or diagrams which describe a theory of economic behavior. Through their simplicity, economic models help to illustrate how economic entities function.

Due to the increasing technical sophistication of positive economic research, quantitative methods in economics began to develop more rapidly. They became massively applied by consolidating liberalism as the dominant economic concept but probably would have been massively used even without a political background because they enabled far more precise scientific explanations and predictions of economic phenomena than could have been imagined. Nevertheless, quantitative models are set dogmatically, and similar to the laws of natural sciences, they are viewed as general laws, and the relationships they explain as causal instead of stochastic. In a short time, the positive methodology in economics turned on itself and moved away from the applied methodology and thus from reality and economic policy as the former basic goal. Methodological literature in the modern period is dominantly related to the positive economy methodology and focuses on broad rules that can be reduced to developing a formal model, hypothesis formation and empirical testing of hypotheses using, again, technical econometrics. „These broad rules may or may not be appropriate for building and testing general theories, laws, or insights that should become

the structural basis for economic thinking” (Colander, 2004, p. 35). They cannot be the basis for formulating economic policies.

The subject of this research is the significant mismatch of the fundamental methods of economic science with the goals of applied economics, which occurs when the dynamics of real processes in the global economy disprove the set basic “laws”. The general hypothesis can be formulated as follows: *If the fundamental postulates of positive economics are applied consistently, without including actual, especially radical changes in the functioning of the modern world economy, their reliability and precision are significantly reduced.*

Under the dynamics of real processes, that is, radical changes, we mean:

a) the impact of rapid technological development based on the functioning of the world economy; and b) intense economic globalization that has placed global value chains (GVCs) at the center of international business. The effects of these two processes on the methodological assumptions of economics are analyzed in separate chapters. First, the problems of applying classical econometric models to the most common macroeconomic topic – economic growth, which in the modern period is primarily determined by the expansion of technology – are investigated. The second part illustrates the devaluation of the fundamental methods used in the key area of the international economy – foreign trade, which since the end of the 20th century has been taking place to the greatest extent within international production chains.

## 2. TECHNOLOGY DEVELOPMENT AND INNOVATION IN ECONOMIC GROWTH MODELS

According to the classic model, the product (output) is generated using two factors of production, labor L (labor) and capital K (capital) (eq. 1). Any increase in productivity, therefore, would have to be caused by an increase in invested capital or the number of workers.

$$Y = F(K,L;t) \tag{1}$$

The sudden technological rise of the 1980s, the growth of investments in IT and the evident application of new technological solutions in the economy did not show up in productivity statistics. According to econometric models, productivity growth in the world economy lagged during the 1970s and 1980s, while at the same time, the computer and technological revolution was apparently making production more and more efficient. Economist Robert Solow famously said in 1987 that *the computer age was everywhere except in productivity statistics*. This phenomenon became known as the Solow paradox. At the same time, with the development of technology, the classic model began to show increasing residual values, which indicated that significant causes of economic growth remained beyond researchers’ understanding.

Significant progress in the discovery of this phenomenon was represented by the works of Abramovitz (1956), Denison (1962; 1979) and Solow (1957; 1959),

which refer to the neoclassical or exogenous theory of economic growth. In their empirical research and theoretical elaborations based on it, they pointed out that economic growth, apart from the nature of labor and capital, is influenced by other, unconventional factors, such as the role of knowledge, technique and technology in economic growth (Kotlica, Stanojević, 2017). However, more than a decade passed before their inclusion in the methodology of economic research, that is, until it was possible to assess their impact.

The most frequently used model of exogenous growth is the Solow-Swan model, which, in addition to the accumulation of capital, labor or population growth, explains economic growth by increasing productivity caused by technological progress. The model has the following form:

$$Y(t)=K(t)^\alpha (A(t)L(t))^{1-\alpha} \quad (2)$$

where  $t$  stands for time,  $Y(t)$  is the total production over a certain period, while  $A$  is a new variable related to technology, i.e. „knowledge”, so that  $AL$  represents the effective labor force instead of just the previous  $L$ , which was related to the number of workers. Even this model did not fully explain the nature of modern economic growth.

It also has a certain unexplained value – the residual, but it is reduced to many times smaller values compared to the classical model. This lower unexplained value can be attributed to “improvement in the quality of work, better training and experience (labor-neutral and labor-materialized technical progress) and inventions that are materialized, incorporated in the construction and application of new machines” (Kotlica, Rankov, 2014).

By including the knowledge variable, productivity growth became visible in the model. Further fragmentation at the national level, specifically in the example of the largest economy – the USA, established mechanisms by which knowledge ‘spilled’ into productivity. In part, the productivity growth of the 1990s reflected rapid, fundamental innovations in semiconductor manufacturing, which translated into increased productivity in that sector (technology) and higher-quality, higher-value inputs for downstream computer manufacturers. In addition, labor-intensive sectors such as retail and wholesale, whose productivity had stagnated for years, have increased productivity sharply, using technology that has made supply chains and distribution centers more efficient.

The new or endogenous theory of growth and technological progress (Arrow, 1962; Romer, 1986; Romer, 1990; Lucas, 1988) offers more radical explanations of the residual and long-term growth of the production potential of economic entities. It emphasizes the role of economies of scale, investment in the sector of Research and Development (R&D), human capital and the role of investment in the diffusion and promotion of technical change. Like the previous model, growth is attributed to technological progress, with the key difference being that it originates from within the economic system – a state or a company. These authors assumed that investment in R&D and intellectual improvement of labor, helped foster endogenous innovation and fuel persistent economic growth.

One of the most frequently cited models of endogenous growth is Romer's (1990). It can be presented in the following form:

$$Y_t = K_t^\alpha (A_t L_t) (A_t H_t) TL \quad (3)$$

where K is capital; A – knowledge, ideas; L – labor in production; H – human capital – which includes activities such as formal education and training of employees; TL – the index of technology level.

Today, the methodology of economic science is faced with an almost identical problem: a kind of second round of the Solow paradox created due to the digitalization process, which cannot be subsumed under earlier technological development and knowledge development. Digitization refers to newer digital technologies such as cloud computing, e-commerce, mobile internet, artificial intelligence, machine learning and the Internet of Things. Digitalization improves production in a sense that goes far beyond the optimization of economic processes in the classical sense. Business models are being fundamentally transformed, value chains are changing, and the boundaries between economic branches are blurring to such an extent that it is no longer possible to identify the sectors into which technological development has „spilled over”.

Adhering persistently to the goal of attributing the universal and exact character of natural sciences to the economy, the official statistics of international organizations are moving in the direction of adding an increasing number of variables, which actually explain a smaller and smaller part of the processes in the world economy. This direction does not improve the economic methodology but increasingly distances macroeconomics from its original application and practical contribution to improving the economy, society, and standards, which is not necessarily the same as economic growth.

### 3. GLOBALIZATION AND METHODOLOGY OF INTERNATIONAL TRADE

International trade, as a branch of macroeconomics, has many specially designed research methods and techniques. Quantitative models enable significant scientific explanations and predictions and provide the basis for creating a successful foreign trade policy.

Thanks to the massive use of information technologies, statistical data on foreign trade are very precise and readily available, enabling and expectedly leading to the expansion of scientific research and published works in this area. Empirical research mainly refers to applying existing theoretical models to individual countries or groups of countries, while most theoretical contributions to the study of international trade refer to minor modifications of existing models. The most commonly used models in international trade are regression analysis, gravity model, *Heckscher-Ohlin* model, *Coefficient of conformity*, and *Balassa and Grubel-Lloyd* index.

We will briefly explain the most common methods in foreign trade to illustrate the information these methods provide to economic policymakers. Regression analysis and the Gravity Model are the standard frameworks for analyzing trade directions and, more precisely, the potential of trade flows.

$$Y = a + b_1 * X_1 + b_2 * X_2 + \dots + b_p * X_p \quad (4)$$

They are very similar in form, and both aim to quantify the impact of factors affecting international bilateral trade ( $Y$  in equation 4). These are usually GDP or GDP per capita, geographic distance (as a representative of transport costs), price level, common language, customs duties, colonial history and others ( $b_1, b_2 \dots$  equation 4). The goal is to predict the volume of trade in the short term, determine the “free space” in the target markets for increasing exports (Stanojević, 2016) or correct one of the factors that can be influenced by economic policies (dummy variables), in order to increase export chances.

Establishing a competitive advantage based on price is not enough for a successful trading strategy. It is also necessary to determine which goods the observed economy can export to marked markets, that is, what it is likely to export if the real exchange rate is favorable. For this purpose, the Coefficient of conformity – CC is often used, which analyzes the degree of conformity between the export of one country and the import of another country of a certain product.

$$CC = \frac{\sum_{i=1}^n XiMi}{\sqrt{(\sum_{i=1}^n XiXi) (\sum_{i=1}^n MiMi)}} \quad (5)$$

Contrary to previous models, it does not assess the total export potential of one country to another but is an assessment of potential export directions for a specific group of products.

Balassa index, i.e. Revealed Comparative Advantage (RCA), determines the comparative advantage of a specific country in producing a selected group of products, i.e. sector. The input parameters are the share of exports of a particular sector in total exports at the level of the observed economy and the global level.

$$RCA_{ij} = \frac{X_{ij} / \sum_j X_{ij}}{\sum_i X_{ij} / \sum_i \sum_j X_{ij}} \quad (6)$$

The Grubel-Lloyd index defines a certain trade direction as intra-industry trade (IIT).  $X$  and  $M$  in equation 7 are export values for the observed activity or product grouping, which is distinguished by its effects on the economy as a significantly different category concerning total exports (Grubel 1967; Grubel and Lloyd 1971;1975).

$$I = 1 - \frac{|X - M|}{X + M} \quad (7)$$

All these methods have provided relatively precise and valuable information for creating economic policies for several decades. Contrary to the aforementioned methodological problem of the appearance of factors for which economic methods do not have appropriate variables, in the case of foreign trade, the key methodological problem is the validity of statistical data. Their veracity in the sense of keeping up-to-date documentation on crossing the border of a specific product is not questionable, but rather the validity of the changed meaning and content of this information.

The changed meaning of trade statistics is a consequence of the international fragmentation of production. This is the most critical characteristic of the last wave of globalization and refers to the dispersion of production, that is, the production chain in several countries. Jones and Kierzkowski (1990) initially proposed the term production fragmentation. Subsequently, Arndt (1997), Venables (1999), Jones and Kierzkowski (2001, 2005), and Deardorff (2001, 2005) made significant contributions to the theory of international fragmentation of production and trade in semi-finished products.

Fragmentation of production, that is, production through internationally dispersed production chains, significantly degrades the validity of statistical data on international trade, especially in the context of the specific goals for which the aforementioned methods of trade research are intended. These data no longer provide an accurate answer to the most common research questions: where, what or how much an economy can potentially export to accelerate growth and development.

Production fragmentation began due to extensive foreign direct investment (FDI), which developed countries invest in low-cost countries. Export statistics show that the host country records increased exports. However, most of the value of exported products actually belongs to the investor (Stanojević, Kotlica 2015). Although it can bring certain benefits, this type of export is not necessarily the goal of economic policies, nor is it an adequate subject of interest for trade policymakers but investors. Fragmentation of production occurs even without the participation of FDI. In current conditions, almost all export companies in different countries, with or without the participation of foreign capital, are part of international production chains.

Another problem for the methodology is that world trade, according to customs data, has a value many times higher than the total produced value. This is also the result of fragmented production and the high volume of trade within production chains. It is about the fact that the goods in the production process, before finalization, cross the border several times. Less developed countries usually import all components of the product, add a part resulting from their own production and export further, or just assemble the product. At the same time, the customs services do not have a mechanism, and in international statistics it is not expected, to calculate only the added value in the exporting country (link of the chain). Each time the value of the entire product is recorded, which is increasing with each stage of production. The initial value of low-grade products or parts, for example cars or machines, is recorded at each border crossing.

Such imports and exports exist only on a statistical level, while the positive effects on economic growth are far smaller, and the impact on the qualitative development of the economy is usually completely absent. Exchange within the value chain since the 1990s has far more value than exchange within the former term. At the beginning of the 21st century, there are almost no products, except for raw materials, that are entirely produced on the territory of one country. If the share of exports within the GVC is large, this, apart from the absence of advantages for the economy of the host country, represents an obstacle for all quantitative research, because it presents a very distorted picture of the volume of exports. As every quantitative method of international trade has as input data statistical data on imports and/or exports (equations 4-7), any research based on standard trade statistics leads to more or less wrong estimates and forecasting.

International trade methods, by themselves, can still be very useful, but with input corrections. For OECD countries, there are statistics of flows within production chains (OECD, 2012), which should be subtracted from the total volume of trade, and only then should the corrected value be applied in the mentioned models. For countries that are not members of the OECD, in the article Stanojević, Kotlica (2018), a procedure for calculating vertical intra-industry trade is proposed. Subtracting this value from the total trade is approximate, but it allows a more realistic representation of the exports of a given country.

Another type of correction needed is also related to globalization and fragmented production. Although the mentioned models were created for the assessment of the trade directions of total exports, in the modern constellation of highly open and closely connected economies, the analysis of total exports actually provides almost insignificant information. Foreign trade models can provide relatively reliable estimates only if they are applied to trade statistics for products of lower levels of aggregation, that is, sub-sectors or product groups.

#### 4. CONCLUSION

The most important question of applied economics is how the insights of positive economic theory can be translated into policies that achieve the goals of a concrete society, taking into account real institutions, sociological and political dimensions of politics?

Despite the precision of quantitative models as the backbone of a positive, fundamental methodology in economics, this type of research, when applied to a specific economy or segment of the economy, in the modern era provides less and less reliable predictions and estimates. A successful methodological approach cannot exclude the importance of qualitative aspects of economic research, such as understanding the specifics of the analyzed economy, its social aspects, internal or external processes and changes. As shown in this study on the example of a key macroeconomic issue - economic growth, and a key issue of the international economy - foreign trade, real changes in the world economy are not only fast and frequent, but transform the very foundations of its functioning.



By setting the fundamental rules of positive methodology in economics, the fact that economics is a social science was neglected, that is, consciously ignored. Quantitative methods and models are important, but not as an end in themselves.

The analysis of the validity of the economic growth model showed that the current dynamics of technological development continuously changes the foundations of the economies themselves, which is why important aspects of economic growth and development remain unrecognized by the application of fundamental methods. Econometric models enable objective and useful analyzes only by continuously adapting to real changes in the domestic or world economy and applying them to specific research questions.

Another problem in the application of the fundamental principles of economics arose from the changes in the basis of production resulting from the modern process of economic globalization. The international dispersion of production chains has led to a significant distortion of data on the volume of foreign trade. In the models most commonly applied in the field of foreign trade, statistical data no longer provide the correct answer to the most common research questions: where, what or how much an economy can potentially export in order to accelerate growth and development. The information that econometric methods offer economic policymakers becomes imprecise or completely wrong. In this area, the methodology has a technically more complex, but achievable requirement for data corrections in two directions. The first is the assessment of the value of trade that, within the production chain, has been customs recorded multiple times and the reduction of trade data by these amounts. Another methodological requirement is the application of methods only to products of the lowest available level of aggregation, because estimates of potential markets for the total exports of any country, in the modern, highly globalized world economy, are completely inappropriate.

After more than a century, the methodology in economics must return to Keynes' neglected definition of what he called the art of economics, which is the linking of insights gained in positive economics with the goals established in normative economics.

#### REFERENCE

- Abramovitz, M. (1956) Resource and Output Trends in the United States Since 1870, *American Economic Review*, No. 46, pp. 5-23.
- Arndt, S. W. (1997) Globalization and the open economy, *The North American Journal of Economics and Finance*, Vol. 8, No. 1, pp. 71-79.
- Arrow, K. (1962) Economic Welfare and the Allocation of Resources for Invention, NBER Chapters, in: *The Rate and Direction of Inventive Activity: Economic and Social Factors*, pp. 609-626, National Bureau of Economic Research, Inc.
- Balassa, B. (1965) *Trade Liberalisation and "Revealed" Comparative Advantage*, The Manchester School of Economics.
- Colander, D. (2004) The art of economics by the numbers, in Roger Backhouse (ed.) *New Directions in Economic Methodology*, Routledge, London and New York.

- Deardorff, A. V. (2001) Fragmentation in simple trade models, *The North American Journal of Economics and Finance*, Vol. 12, No. 2, pp. 121–137.
- Deardorff, A. V. (2005) A trade theorist's take on skilled-labour outsourcing, *International Review of Economics and Finance*, Vol. 14, No. 3, pp. 259–271.
- Denison, E.F. (1962) *The Sources of Economic Growth in the United States and the Alternatives before Us*. Committee for Economic Development, New York.
- Denison, E.F. (1979) *Accounting for Slower Economic Growth examines labor productivity and productivity accounting during the 1970s in the United States*. Brookings Institution.
- Grubel, Herbert G. and Lloyd, Peter J. (1971) The Empirical Measurement of Intra-Industry Trade. *Economic Record*, Vol. 47, No. 4, pp. 494–517.
- Grubel, H. G. and Lloyd, P. J. (1975) *Intra-Industry Trade. The Theory and Measurement of International Trade in Differentiated Products*, John Wiley & Sons.
- Jones, R. W. and Kierzkowski, H. (2001) A framework for fragmentation, in S. W. Arndt and H. Kierzkowski (eds) *Fragmentation: New Production Patterns in the World Economy*, Chapter 2, pp. 17–34, Oxford University Press.
- Jones, R.W. and Kierzkowski, H. (2005) International fragmentation and the new economic geography, *The North American Journal of Economics and Finance*, Vol. 16, No. 1, pp. 1–10.
- Kotlica, S. i Rankov, S. (2014) *Uticaj inovacija i tehnologija na konkurentnost savremenog poslovanja*, Megatrend univerzitet.
- Kotlica, S. i Stanojević, N. (2017) *Tehnologija, inovacije i konkurentnost u globalizovanoj privredi*, Dositej, Beograd.
- Lucas, R. (1988) On the mechanics of economic development, *Journal of Monetary Economics*, Vol. 22, No. 1, pp. 3-42.
- OECD, WTO (2012) Trade in Value-Added: Concepts, Methodologies and Challenges, Retrieved February 23, 2019, from [www.oecd.org/sti/ind/49894138.pdf](http://www.oecd.org/sti/ind/49894138.pdf)
- Romer, P. M. (1990). Endogenous Technological Change, *Journal of Political Economy*, Vol. 98, No. 5, Part 2.
- Romer, P. M (1986) Increasing Returns and Long Run Growth, *Journal of Political Economy*, Vol. 94, No. 5.
- Solow, R. (1957) Technical Change and the Aggregate Production Function, *The Review of Economics and Statistics*, Vol. 39, No. 3 pp. 312-320. <https://doi.org/10.2307/1926047>
- Solow, R. (1959) Investment and Technical Progress. In K. Arrow, & Suppes (Eds.), *Mathematical Methods in the Social Sciences*, Stanford.
- Stanojević, N. (2016) Russian Food Products Market - New CEFTA Export Opportunity, *Industrija*, vol. 44, No. 4, pp. 175-196.
- Stanojević, N. and Kotlica, S. (2015) The Features and Effects of Foreign Direct Investment in the Transition Economies, *Zbornik matice srpske za društvene nauke*, No. 3, pp. 543-555.
- Stanojević, N. and Kotlica, S. (2018) Globalisation and methodology of researches in international trade, *Industrija*, Vol. 46, No. 2. pp. 21-38.
- Venables, A. J. (1999). Fragmentation and multinational production, *European Economic Review*, Vol. 43, No. 4-6, pp. 935–945.

Наташа Н. СТАНОЈЕВИЋ

САВРЕМЕНИ ПРОЦЕСИ У ГЛОБАЛНОЈ ЕКОНОМИЈИ  
И МЕТОДОЛОГИЈА ЕКОНОМСКИХ НАУКА

Резиме

У раду се истражују недостаци темељних претпоставки економске методологије и ограничења њихове примене услед савремених процеса који су довели до корених промена у самим основама светске привреде. У фокусу истраживања је некомпатибилност метода позитивне економске науке са циљевима примењене економије. Општа хипотеза је: уколико се основни постулати позитивне економије примењују доследно, без укључивања стварних, посебно корених промена у функционисању савремене светске привреде, њихова поузданост и прецизност се значајно смањују. Рад има два кључна дела која се односе на два најкритичнија савремена процеса који постављају нове изазове економској методологији у светској економији. Први је утицај технолошког развоја, који доводи до повећања необјашњивих вредности привредног раста у класичним економетријским моделима. Други анализирани процес је економска глобализација која је поставила глобалне ланце вредности (GVC) у центар међународног пословања. Повећање обима међународне трговине унутар GVC-а довело је до изобличења статистичких података о трговини и девалвације резултата фундаменталних истраживања. Резултати су показали да фундаментална истраживања и даље могу бити значајна за економске политике, али уз континуирано праћење реалних процеса и њихово укључивање у основне методе, било укључивањем нових фактора, корекцијама улазних података или модела.

*Кључне речи:* економска методологија, економски раст, међународна трговина, глобализација, технолошки напредак, економске политике.