



РАҚАМЛАШТИРИШ ШАРОИТИДА МЕҲНАТ БОЗОРИНИ ПРОГНОЗЛАШТИРИШ УЧУН CGE-МОДЕЛЛАРНИ ҚЎЛЛАШ БЎЙИЧА ҲОРИЖ ТАЖРИБАСИ

Отақўзиева Зухра Маратдаевна -
и.ф.н., Муҳаммад ал-Хоразмий номидаги
Тошкент ахборот-технологиялари
университети "Почта алоқаси технологияси"
кафедраси доценти

Отақўзиева Сурайё Алишеровна -
Тошкент давлат иқтисодиёт университети ҳузуридаги
"Ўзбекистон иқтисодиётини ривожлантиришнинг
илмий асослари ва муаммолари" илмий-тадқиқот маркази
"Демография ва меҳнат бозори" сектори докторанти

https://doi.org/10.55439/ECED/vol23_iss5/a28

Аннотация. Мақолада хорижда меҳнат бозори ҳолатини баҳолаш учун қўлланиладиган энг самарали CGE-моделларнинг қиёсий таҳлили келтирилган. Шунингдек, рақамлаштириш шароитида Ўзбекистонда жорий қилинган "Ягона миллий меҳнат тизими" идоралараро дастурий-аппарат комплексининг асосий вазифаларидан келиб чиққан ҳолда, ўрганилган хориж тажрибаси асосида Ўзбекистон миллий меҳнат тизими ривожланиши ва такомиллашиши учун истиқболли йўналишлар белгиланган.

Калит сўзлар: рақамли технологиялар, меҳнат бозори ва бандликни прогнозлаштириш, CGE-моделлар (ҳисобланадиган умумий мувозанат моделлари), "Ягона миллий меҳнат тизими" идоралараро дастурий-аппарат комплекси.

МИРОВОЙ ОПЫТ CGE-МОДЕЛЕЙ ДЛЯ ПРОГНОЗИРОВАНИЯ РЫНКА ТРУДА В УСЛОВИЯХ ЦИФРОВИЗАЦИИ

Отақўзиева Зухра Маратдаевна -
к.э.н., доцент кафедры "Технология почтовой связи"
Ташкентский университет информационных
технологий имени Мухаммада ал-Хоразмий
Отақўзиева Сурайё Алишеровна -
докторант сектора "Демография и рынок труда"
Научно-исследовательский центр "Научные основы и
проблемы развития экономики Узбекистана" при ТГЭУ

Аннотация. В статье представлен сравнительный анализ наиболее успешных мировых практик внедрения CGE-моделей представленных для оценки рынка труда. Исходя из основных задач внедренного в условиях цифровизации межведомственного программно-аппаратного комплекса «Единая национальная система труда» Узбекистана, учитывая зарубежный опыт регулирования рынка труда выделены перспективные направления для дальнейшего развития и совершенствования национальной цифровой системы труда Узбекистана.

Ключевые слова: цифровые технологии, прогноз занятости и рынка труда, CGE-модели (Вычислимые модели общего равновесия).

FOREIGN EXPERIENCE OF CGE-MODELS FOR LABOR MARKET FORECASTING IN THE CONTEXT OF DIGITALIZATION

Otakuzieva Zukhra Maratdaevna -
PhD, Associate Professor of the department of
"Technology of postal communication"
Tashkent university of information technologies
named after Muhammad Al-Khwarizmi
Otakuzieva Surayyo Alisherovna -
PhD researcher of the sector "Demography
and labor market" Research center "Scientific basis
and issues of economic development of Uzbekistan"
under the Tashkent state university of economics

Abstract. The article represents a comparative analysis of the most successful global practices for the implementation of CGE models presented for assessing the labor market. Based on the main tasks of the interdepartmental software and hardware complex "Unified national labor system" of Uzbekistan, introduced in the context of digitalization, taking into account foreign experience in regulating the labor market, perspective directions for further development and improvement of the national digital labor system of Uzbekistan have been identified.

Keywords: digital technologies, labor market and employment forecasting, CGE-models (Computable General Equilibrium models), the interdepartmental software-hardware complex "Unified national labor system"

Introduction. Of the many diverse and fascinating challenges we face today, the most intense and important is how to understand and shape the new technology revolution, which entails nothing less than a transformation of humankind. We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another[1]. The fourth industrial revolution is different from previous ones with its high rate of change, a large number of simultaneously occurring changes and complete transformation of all systems. Despite the potential positive impact of technology on economic growth, it is nonetheless essential to address its possible negative impact, at least in the short term, on the labor market [1]. Accordingly, there is no doubt that digitalization changes the nature of labor in all industries and professions.

Over the coming years, labor market dynamics and employment problems in both developed and developing countries will be formed under the influence of a new driver - digital technologies. Today, the digital revolution has enveloped much of the world, giving impetus to the development of

trade, transport, finance, industry, education system, health care and public management. Under the influence of digital technologies not only new types of professions will change, but also qualification structure of labor market will do.

Under such circumstances, the state needs to forecast timely trends in the labor market and take appropriate measures to promote decent work for all, productive employment, encouraging life-learning opportunities and ensure inclusive quality education.

As is known, the main features of the digital revolution are the widespread use of the Internet and the availability of its mobile version in miniature production devices-gadgets, smartphones ITU estimates that approximately 4.9 billion people – or 63 per cent of the world’s population – are using the Internet in 2021. This represents an increase of 17 per cent since 2019, with 782 million people estimated to have come online during that period. Consequentially, in our opinion the growth of Internet access to the development and the formation of the digital economy (Fig.1).

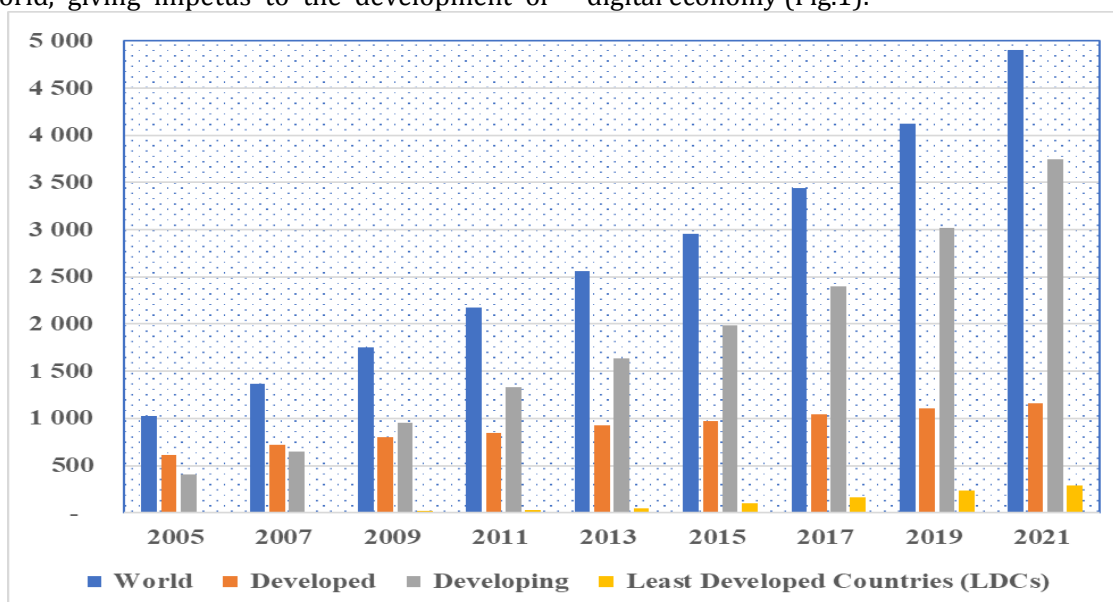


Fig. 1. Individuals using the Internet, millions[19]

Due to this rapid development of technology in recent decades, some professions have outdated, completely new ones have appeared. The development of Internet commerce, the use of mobile banking, the use of online platforms threatens the existence of such categories of professions as cashier, postman, travel agent, taxi dispatcher, etc. [2]. In the same time professions that did not exist before appeared: data analysts and experts in artificial intelligence, high technology specialists working with big data and etc (Fig.2).

It is important to realize that many of today's youth in the future have to work in specialties that are not even found today. Due to rapid changes in the labor market, use of digitalization, competent

forecasting the economy in qualified personnel becomes a priority of national governments.

Literature review. There are two approaches to forecasting the labor market: macro- and microeconomic. The first is used in the formation of forecast needs at the level of the country and its regions, the second at the level of enterprises and organizations. Both approaches have significant value for the adoption of further socio-economic reforms. But in this paper, we will study foreign approaches to forecasting the labor market at the macro level.

Some foreign and local researchers considered various models of labor market forecasting in their works.

Specializations in growing demand in the digital labor market		Specializations in decreasing demand in the digital labor market	
↑	Data analysts and researchers	↓	Data entry skills
↑	Experts in artificial intelligence	↓	Accountants, auditors, cashiers
↑	High technology specialists working with big data	↓	Customer information and customer service staff
↑	Digital marketing specialists	↓	Specialists in recording and storage of raw materials
↑	Specializations in network automation processes	↓	Postal workers
↑	Specializations related to digital business development	↓	Specialists in recording and storage of raw materials
↑	Specializations in information security	↓	Financial analysts
↑	Specializations in software and program development	↓	Sales representatives
↑	"Internet of Things" specialists	↓	Bank employees
↑	Web-Program managers	↓	Door-to-door and street sales representatives
↑	Robot engineers	↓	Specialists of personnel department

Fig. 2. Classification of specialties that are increasing and decreasing demand in the digital labor market

Source: Authors' elaboration on the basis of the studying materials

In a number of publications, the authors [3,4,5] examined in detail the models of the U.S. Bureau of labor statistics in the field of macroeconomic forecasting of labor market supply and demand.

Adams et al. [6] and Meagher [7] also used the model MONASH for producing labor market forecasts.

Based on the demand of the economy's sectors in the professional structure, in the paper of L.Sultanova [8] labor market forecasting is considered as an important part of the information necessary for developing measures to regulate and control changes in the educational services market, for strategic planning of a demand-oriented system of training and retraining of personnel.

The experts of the Institute of Forecasting and Macroeconomic Research [9] conducted a study on the formation of demand for labor force, as well as the forecast of employment in the labor market of Uzbekistan until 2026. The forecast for the formation of demand for personnel by sectors of the economy is calculated using a regression model based on panel data with random effects.

Methodology. The study is based on the methodology of comparing analogues, which involves conducting a comparative analysis of the labor market forecasting experience in foreign countries,

which have achieved the most significant success in that area.

Results. A perspective system for quantifying the actions of national governments, including forecasting the economic situation and due administrative decisions are accessible by Computable General Equilibrium models (referred to as CGE). Such economic and mathematical models are a system of equations, the solution which is the general economic equilibrium of supply and demand for markets of goods and services, including the labor market. CGE models allow find approaches to solving issues of state regulation economics [10].

Model of the Bureau of labor statistics of the United States (The bureau of labor statistics of the USA) is a system of economic and mathematical models, which forecasts the need of the national economy for qualified workforce. The forecast is carried out by types of economic activity, specialties and professions both in the industry, and territorial sections. The system uses the model intersectoral balance for forecasting employment by 22 groups professions, which makes it possible to forecast total employment by type of economic activity [11].

Devised by the institute of economic structures research in Germany, the INFORGE (Interindustry Forecasting Germany) model analyzes changes in the structure of the economy, including the

labor market, forecasting the demand of labor resources according to types of employment, occupational structure and skill level.

The multisectoral mathematical model of MDM is forecasting system of the UK's labor market, devised to look ahead at changing occupational patterns in the relevant sectors of the economy. Forecasting is carried out with using science-based foresight, analysis of structural changes of economy, the dynamics of the market for goods and services, as well as the level of sectoral labor productivity [12].

The MONASH model is also based on the CGE model and is applied macroeconomic model of Australia, which allows detecting general equilibrium conditions in the labor market and employ-

ment by industries of national economy. The forecasting system allows to determine total employment and elaborate the structure of the most in-demand competencies in the labor market.

Based on the CGE model "RUSEC" is a national system forecasting of the Russian Federation. The developed system by Academician Makarov V.L. allows forecasting the dynamics of two labor force markets: the labor market of private enterprises and the labor market, paid from the state budget, and also assess the total demand and supply of labor on the scale national economy [10].

Table 1 represents the most successful CGE-models used for labor market forecasting, which to date have approved in developed countries.

Table1.

Features of CGE-models for labor market forecasting

Nº	CGE-model	Country	Features
1.	BLS	The USA	The feature of the model is application of statistics with quantitative and qualitative forecasting methods (surveys of employers, experience and recruitment agencies), which allows more accurately calculate forecast data [13]
2.	INFORGE	Germany	Model forecasts the demand for labor resources in the sectoral and territorial sections for 16 federal states, which allows to analyze the future employment in the context of individual specialties by sectors of the economy, as well as on the national labor market as a whole [14]
3.	MDM	The Great Britain	MDM identifies long-term trends dynamics of employment and generates a forecast of the distribution of employed people by 25 groups specialties in the context of 50 sectors of the economy [15]
4.	MONASH	Australia	MONASH forecasts the demand for labor resources in the context of 282 professions, 113 sectors of the national economy and 56 regions of Australia [16]
5.	RUSEC	Russia	The model allows forecasting the dynamics of two labor markets: the labor market of private enterprises and the labor market, paid from the funds the state budget, as well as to assess the total demand and supply of labor on the scale of national economy

Source: Authors' elaboration on the basis of the studying materials

Discussion. Pursuant to the President Resolution of the Republic of Uzbekistan dated October 31, 2019, № 4502 on measures to introduce the interdepartmental hardware and software complex "Unified national labor system", as well as in order to introduce modern information technologies into labor relations and personnel records management Cabinet of Ministers has developed Resolution № 971 of December 05, 2019 on organizational measures to ensure the implementation and functioning of the interdepartmental software-hardware complex "Unified National Labor System" [17].

The interdepartmental hardware and software complex "Unified National Labor System" shall provide [18]:

implementation of electronic registration of labor relations between employers and employees, including procedures for concluding labor contracts, making amendments and additions to labor contracts, as well as their termination;

formation of an electronic database on the structure (staffing table) of employers, including information on available and created jobs, working conditions, remuneration;

formation and maintenance of data on the labor activity of citizens in an electronic work book, based on information about the accounting of the length of service of employees, information on accrued wages and paid taxes on personal income in the form of wages, contributions to individual accumulative pension accounts of citizens;

introduction of interdepartmental systematized and regular electronic exchange of data containing information on the state and dynamics of labor market indicators, to enhance coordination and effectiveness of the state policy in the field of employment;

formation of objective, transparent and up-to-date information on the quantitative and qualitative composition of personnel and employees,

vacancies, compiled automatically, as well as on the qualification and other requirements of employers for candidates for employment;

formation of a periodically updated balance of labor resources, including data on categories of labor resources;

monitoring the results of inspections of labor relations and labor protection, implementation of employment programs, examination of certification of workplaces, as well as the completeness of placement in the Unified Register of professional participants in the labor protection services market of relevant information (information);

the possibility of online registration of citizens leaving for temporary work outside the Republic of Uzbekistan, creation of a database on citizens employed outside the Republic of Uzbekistan on the basis of agreements on organized labor migration;

formation of forecasts for the development of the labor market, the structure of supply and demand for labor;

integration of the implemented and planned for implementation information resources of the Ministry of Employment and Labor Relations of the Republic of Uzbekistan.

The interdepartmental hardware and software complex "Unified National Labor System" shall be maintained by the Ministry of Employment and Labor Relations of the Republic of Uzbekistan.

Conclusion. The review on foreign experience of CGE-models in forecasting supply and demand

in the labor market allowed the authors to make the following conclusions:

- over the next few years the dynamics of labor and employment markets in both developed and developing countries, including the Republic of Uzbekistan, will be formed under the influence of digital technologies. This factor leads to the development of the labor market forecasting in the professional and qualification context. Such forecasting makes it possible to form the basis of the strategic directions for the socio-economic development of the country in conditions of digital economy.

- in foreign countries, in order to forecast the development of labor markets and employment, they use CGE-models, reflecting the specifics of the socio-economic processes and the dynamics of labor markets and employment in a particular state. It should be noted that in the countries of researched CGE-models has been formed an integrated approach for labor market demand.

It would be appropriate to develop a national CGE-model (based on the foreign analogues), allowing to research the structural changes of the economy of Uzbekistan, in particular labor market features in industrial and regional aspects. And integrate the model to the interdepartmental hardware and software complex "Unified National Labor System", maintaining by the Ministry of Employment and Labor Relations of the Republic of Uzbekistan.

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АҲОЛИ ДАРОМАДЛАРИНИНГ ЎЗГАРИШ ТЕНДЕНЦИЯЛАРИ ВА УНГА ТАЪСИР ЭТУВЧИ ОМИЛЛАРНИНГ ИЛМИЙ АСОСЛАРИ

Бадалов Шарифбой Джураваевич -
Тошкент молия институтининг
мустақил тадқиқотчиси

https://doi.org/10.55439/ECED/vol23_iss5/a29

Аннотация. Мазкур мақолада аҳоли даромадлари шаклланишининг илмий-назарий асослари, аҳоли даромадларининг шаклланиш манбалари ва уларнинг асосий жиҳатлари баён этилган. Аҳоли даромадлари шаклланишининг амалдаги ҳолати таҳлил қилинган ва асосий хулосалар шакллантирилган. Аҳоли даромадларини ошириш ва унга таъсир этувчи омиллар таснифланган. Аҳоли даромадларини оширишга доир илмий тавсиялар келтирилган.

Калит сўзлар: аҳоли даромадлари, камбағаллик, реал даромадлар, трансфертдан олинган даромад, инфляция, стратегия, давлат бюджети.

ТЕНДЕНЦИИ ИЗМЕНЕНИЯ ДОХОДОВ НАСЕЛЕНИЯ И НАУЧНОЕ ОБОСНОВАНИЕ ВЛИЯЮЩИХ НА НИХ ФАКТОРОВ

Бадалов Шарифбой Джураваевич -
Независимый исследователь
Ташкентского финансового института

Аннотация. В данной статье описаны научно-теоретические основы формирования доходов населения, источники формирования доходов населения и их основные аспекты. Проанализировано фактическое состояние формирования доходов населения и сформулированы основные выводы. Классифицируются рост доходов населения и факторы, влияющие на него. Представлены научные рекомендации по увеличению доходов населения.

Ключевые слова: доходы населения, бедность, реальные доходы, трансфертный доход, инфляция, стратегия, государственный бюджет.

CHANGING TENDENCIES OF POPULATION INCOME AND THE SCIENTIFIC BASIS OF FACTORS AFFECTING IT

Badalov Sharifboy Dzhuravaevich -
Independent researcher of the
Tashkent Financial Institute

Annotation. This article describes the scientific-theoretical basis of population income formation, the sources of population income formation and their main aspects. The actual situation of population income formation was analyzed and the main conclusions were formed. Increasing population income and factors affecting it are classified. Scientific recommendations on increasing the income of the population are presented.

Key words: population income, poverty, real income, transfer income, inflation, strategy, state budget.

Кириш. Аҳоли даромадларини ошириш ва камбағалликни қисқартириш Янги Ўзбекистоннинг фундаментал асосларини ривожлантириш

даги устувор мақсадлардан бири сифатида белгиланди. Кейинги йилларда аҳоли даромадларини ошириш, қўшимча даромад олиш имко-