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ECONOMETRIC ASSESSMENT OF THE IMPACT OF ECONOMIC INDICATORS ON THE NON-OBSERVED ECONOMY OF MOLDOVA

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ABSTRACT

The non-observed economy is an integral part of the modern economic system, representing a threat to economic security in conditions of slow stagnation. The relevance of this study lies in the fact that the identification of factors influencing the non-observed economy makes it possible to develop proposals to combat this phenomenon. At the same time, some problems in econometrically modeling the dependence of the non-observed economy on socio-economic indicators are highlighted. The novelty and purpose of the study is the construction of models with one equation, where the endogenous variable is the level of the non-observed economy in value terms and the share of the non-observed economy in GDP. The main research methods are regression analysis and economic and mathematical modeling. At the first step of the study, the identified main factors of influence that determine the size of the shadow economy in twenty-eight countries of the world were systematized. In the next step, exogenous variables were identified based on the statistical data published by the National Bureau of Statistics of Moldova. The econometric analysis software EViews 9 was used to develop the models of the dependence of the non-observed economy in Moldova on socio-economic indicators. Single-equation models were tested and checked first-order and second-order autocorrelation of the regression errors and heteroscedasticity. The constructed models showed that the growth of the main sectors of the national economy and an increase in the unemployment rate lead to the growth of the non-observed economy in Moldova, while the rise in foreign trade turnover, namely imports, negatively affects the endogenous variable. There is a negative relationship between the freight turnover and the level of the non-observed economy.

Keywords: *non-observed economy; economic indicators; regression analysis; economic and mathematical modeling; single-equation models.*

Economia neobservată este o parte integrantă a sistemului economic modern, reprezentând un pericol pentru securitatea economică a statului în condițiile stagnării latente. Relevanța acestui studiu constă în faptul că identificarea factorilor care influențează economia neobservată face posibilă elaborarea propunerilor de combatere a acestui fenomen. Totodată, se evidențiază unele probleme în elaborarea modelelor econometrice a dependenței economiei neobservate de indicatorii socio-economici. Noutatea și scopul studiului este construirea modelelor care conțin o singură ecuație, în care variabila endogenă este nivelul economiei neobservate în expresie valorică și ponderea economiei neobservate în PIB. Principalele metode de cercetare sunt analiza regresională și modelarea economico-matematică. La prima etapă a studiului, au fost sistematizați principalii factori de influență care determină nivelul economiei tenebre în douăzeci și opt de țări ale lumii. La etapa următoare, în baza seriilor de date statistice publicate de Biroul Național de Statistică al Moldovei, au fost identificate variabilele exogene. La elaborarea modelelor dependenței economiei neobservate în Moldova de indicatorii socio-economici, a fost utilizat programul de analiză econometrică EViews 9. Modelele cu o singură ecuație au fost testate, inclusiv a fost efectuată testarea autocorelării erorilor de ordin întâi și doi, și heteroscedasticității. Modelele construite au arătat că creșterea principalelor sectoare ale economiei naționale și majorarea ratei șomajului duc la sporirea economiei neobservate în Moldova, în timp ce majorarea volumului comerțului exterior, și anume a importurilor, are un impact negativ asupra variabilei endogene. O relație negativă se înregistrează între parcursul mărfurilor și nivelul economiei neobservate.

Cuvinte-cheie: *economie neobservată; indicatori economici; analiza regresională; modelare economico-matematică; modele cu o singură ecuație.*

Ненаблюдаемая экономика является неотъемлемой частью современной экономической системы и представляет угрозу для экономической безопасности государства в условиях вялотекущей стагнации. Релевантность данного исследования состоит в том, что выявление

факторов влияния на ненаблюдаемую экономику позволяет разработать предложения по борьбе с данным явлением. В то же время, при эконометрическом моделировании зависимости ненаблюдаемой экономики от социально-экономических показателей были выявлены некоторые проблемы. Новизна и цель исследования — построение ряда моделей с одним уравнением, где эндогенной переменной выступают уровень ненаблюдаемой экономики в стоимостном выражении и доля ненаблюдаемой экономики в ВВП. Основные методы исследования: регрессионный анализ и экономико-математическое моделирование. На первом этапе исследования были систематизированы выявленные основные факторы влияния, определяющие размер теневой экономики в двадцати восьми странах мира. На следующем этапе, отталкиваясь от статистических данных, опубликованных Национальным Бюро Статистики Молдовы, были определены экзогенные переменные. При построении моделей зависимости ненаблюдаемой экономики в Молдове от социально-экономических показателей, была использована программа эконометрического анализа EViews 9. Модели с одним уравнением были протестированы, в том числе на автокорреляцию случайных отклонений первого и второго порядка, и на наличие гетероскедастичности. Построенные модели показали, что рост основных отраслей национальной экономики, а также повышение уровня безработицы приводит к росту ненаблюдаемой экономики в Молдове, в то время как увеличение внешнеторгового оборота, а именно импорта, отрицательно влияет на эндогенную переменную. Отрицательная зависимость была выявлена между грузооборотом и уровнем ненаблюдаемой экономики.

Ключевые слова: *ненаблюдаемая экономика; экономические показатели; регрессионный анализ; экономико-математическое моделирование; модели с одним уравнением.*

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INTRODUCTION

The non-observed economy is a significant and inevitable part of world economic activity. Globalization has taken the shadow economy to a new higher level. This activity is unregulated, taxes are not being collected, and the state loses part of the income. Informal employment leads to a decrease in wages, in the solvency of the population, and non-compliance with sanitary and safety standards. Not only businesses but also governments are in contact with the shadow economy, which creates not only economic and ethical problems but also political ones. It is especially characteristic of least developed countries with a low level of population well-being.

There is practically no type of economic activity in Moldova that does not contain elements of the non-observed economy. This is a big problem for economic security of the country, especially in the current period. Therefore, it is relevant to study the essence of the non-observed economy, identify the factors of influence to understand how to deal with it, and if not eradicate it at all, then at least reduce the level.

The main objective of this study is to develop econometric models of the non-observed economy that would allow us to determine the main factors of influence and the direction of the correlation. This study is a continuance of the work “Comparative analysis and adaptation of methods for assessing the non-observed economy (case of Moldova)”. The novelty of this study is to elaborate models which differ from those developed by the World Bank and from those worked out by the authors in previous works since the goal was not to assess the non-observed economy but to study the factors of influence and the direction of the relationship (positive or negative).

LITERATURE REVIEW

There are comparatively few papers in the world scientific literature that study the factors that influence the non-observed economy, especially using econometric modeling. While a number of methods are used for evaluation. The most commonly used methods are listed in Table 1.

Table 1

Some methods of evaluation of the non-observed economy

METHODS	THE ESSENCE OF THE METHOD	SCIENTIFIC SOURCES
Fiscal audit	This is a direct method which could be used data obtained from direct sources – surveys, State Tax Service, etc.	Williams (2014)
Electricity consumption method	This is an indirect method. The elasticity between electricity consumption and gross domestic product (GDP) is constant and approximately equal to 1. Based on the dynamics of electricity consumption, it is possible to calculate the total GDP and compare it with the official GDP.	Kaufmann and Kaliberda (1996)
Income-expenditure method based on the methodology of SNA	Comparing income with expenditure, the hidden part of productive economic activity is quantified.	Schneider and Kearney (2013)
Currency demand method	This method is based on the assumption that all shadow transactions are made in cash, and the collection of taxes is the main reason for going underground.	Tanzi (1983)
Modeling method (for example: MIMIC multiple-indicators multiple-causes model)	MIMIC method is used to determine the relationship between cause and indicator variables and the level of the non-observed economy, which is a latent variable.	Medina and Schneider (2018)

Source: *Systematization by authors*

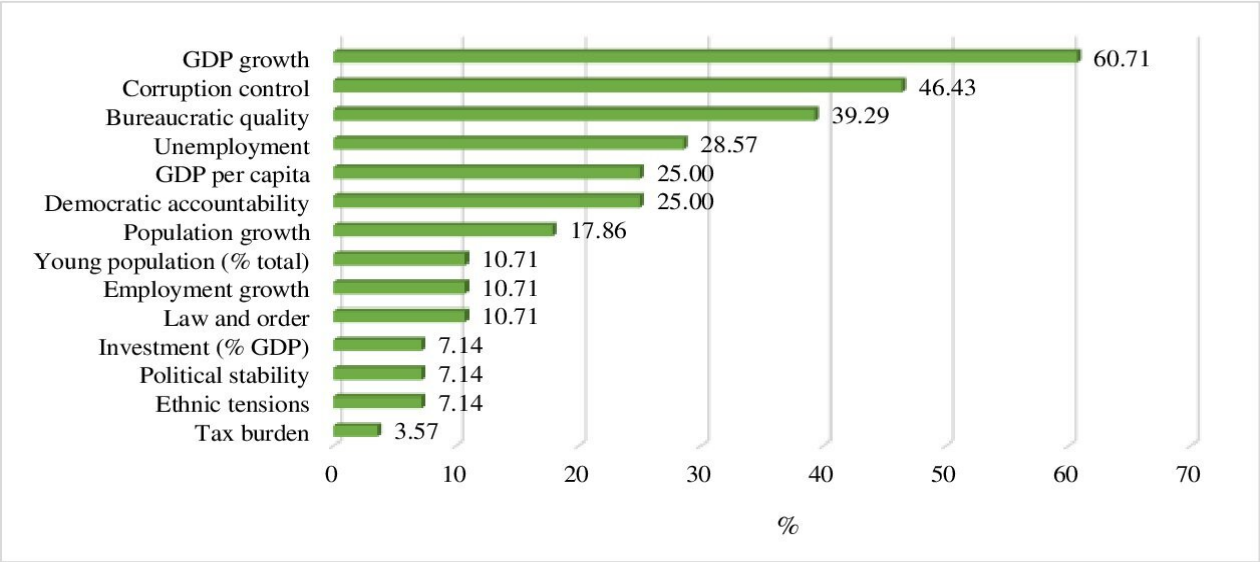
ACCA (Association of Chartered Certified Accountants) experts identified three key factors that determine the size of the shadow economy for each of the 28 countries studied. For the world economy, the most significant factors are bureaucratic quality, corruption control, and GDP (Gross Domestic Product) per capita. The importance of each influence factor varies from country to country. For example, GDP growth, GDP per capita, and employment growth are the top three reasons for the increase in the size of the shadow economy in the USA. In the case of Brazil, these are corruption control, bureaucratic quality, and the young population (% of the total population) (ACCA, 2017: 12).

According to the ACCA survey of 28 countries, 60.71% named GDP growth one of the three main factors that determined the size of the shadow economy, 46.43% – corruption control, and 39.29% – bureaucratic quality (Figure 1). Thus, to reduce the shadow economy, most of the 28 countries need to increase the GDP growth rate, reduce corruption and improve the quality of the bureaucracy.
Based on the results obtained by ACCA, E. Drobot and I. Makarov systematized the factors influencing the shadow economy as:

- *economic factors,*
- *business environment factors,*
- *socio-demographic factors,*
- *socio-environmental factors,*
- *management factors,*
- *scientific and technical factors.*

Figure 1.

The top influence factors that determine the size of the shadow economy by 28 countries



Source: *calculated by authors based on the data from the ACCA (ACCA, 2017: 12)*

Among the economic factors that have a significant impact on the shadow economy, scientists have identified a high tax burden, a recession in the local economy, the complexity of the tax system, a global recession, the ease of participating in the informal sector, and the ease of tax evasion (Дробот & Макаров, 2021).

A. Suslina and R. Leuhin believe that to effectively bring the economy out of the shadow, it is necessary first of all to determine the fundamental causes of this phenomenon. The key factors shaping the shadow economy are "a relatively high tax burden, especially on taxes on labor (including social contributions), administrative barriers to doing business, poor quality of state public institutions, poor quality of labor market regulation, problems of illegal labor, corruption among representatives of the regulatory authorities" (Суслина & Леухин, 2016: 46).

There are relatively more studies on the impact of the non-observed economy on the national economy (Massenot & Straub, 2016; Elgin & Oztunali, 2012; Antunes et al., 2008; Loayza et al., 2004) than surveys of factors influencing it (Реутов & Кифяк, 2021). At the same time, there is a relationship between these two groups of studies. While scientists from the first group argue that the non-observed economy affects economic growth and GDP per capita, scientists from the second group are confident that these two indicators are among the top five influence factors on the level of the non-observed economy. Worth bearing in mind that Ceyhun Elgin & Serdar Birinci found that "the size of the informal economy is mainly associated with growth in Total Factor Productivity, and this relationship very much interacts with GDP per capita" (Elgin & Birinci, 2016: 289).

V. Reutov and A. Kifyak systematized the results of the study by V. Zhukauskas (Zhukauskas, 2015) and identified the following six main groups of factors that form the structure of shadow processes in the economy:

- *social security contributions and tax rates,*
- *tax nihilism,*
- *quality of public institutions,*
- *effectiveness of the social provision,*
- *regulation of the labor market,*
- *the share of communal fees in the cost structure (Реутов & Кифяк, 2021: 95).*

There are a few surveys in this field in Moldova. The object of research is to evaluate the non-observed economy (Costandachi, 2016; Ganciucov et al., 2015), the perception of the population and companies on the informal economy (UNDP, 2021), and not to identify the influence factors. Therefore, it led the authors to explore the factors influencing the unnoticed economy of Moldova.

DATA SOURCES AND USED METHODS

Regression analysis and correlation analysis were applied to assess the impact of macroeconomic indicators on the non-observed economy. Initially, 34 indicators were selected based on a logical analysis. The level of the non-observed economy in value terms and the share of the non-observed economy in the GDP were chosen as endogenous variables. The initial information for the formation of the database was the statistical data of the National Bureau of Statistics (NBS) of Moldova (StatBank, 2022) and the results of the calculation of the non-observed economy using the adapted Currency Demand Approach (CDA). The number of observations is 21 (2000-2020). The most significant socio-economic indicators were considered exogenous variables (34). All value indicators are in current prices.

The authors encountered some problems in econometric modeling of the dependence of the non-observed economy in Moldova on socio-economic indicators. The first difficulty is the small sample of data for some indicators. The second difficulty is the incompatibility of the data to the previous period because BNS modified the methodologies for estimating the following indicators:

- *BNS modified the methodology of the Household Budget Survey in 2019, and the statistical data on "Consumption expenditures of the population" and "Disposable incomes of the population" was interrupted this year*
- *A new indicator, Investments in non-current assets, was calculated starting 2017. It is not comparable with "Investments in long-term tangible assets." The data series of the second indicator was discontinued in 2016;*
- *The data on the "Volume of industrial production" are presented according to the new Classifier of Activities in the Economy of Moldova (CAEM-2) for the period 2011-2020. There are no data for the previous period (2000-2010);*
- *The series of statistical data "Volume of paid services rendered to population" was interrupted in 2011; etc.*

In the second stage, the indicators whose data series was interrupted and whose calculation methodology was modified were removed from the list of exogenous variables. As a result, out of 34 variables only 13 remained (Table 2).

Table 2

System of exogenous variables

DESIGNATION	EXOGENOUS VARIABLE	UNIT
agr	Gross agricultural production	Million lei
cons	Value of construction works	Million lei
road	Constructed new roads with hard surface	Kilometer
x	Export	Million USD
m	Import	Million USD
tran	Transported goods	Million tonnes
turn	Turnover of goods	Million tonnes-kilometers
eleu	Monthly gross average earnings	Moldovan Leu
eeuro	Monthly gross average earnings	Euro
eusd	Monthly gross average earnings	US Dollar
arate	Activity rate	Percent
erate	Employment rate	Percent
urate	Unemployment rate	Percent

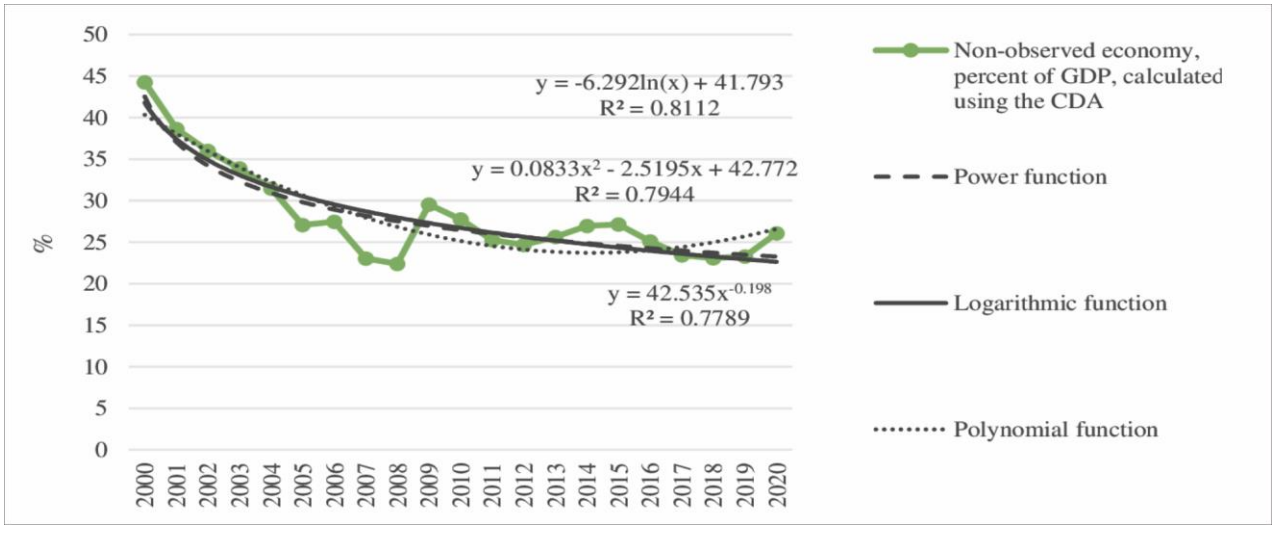
Econometric models of the dependence of the non-observed economy in Moldova on the macroeconomic indicators were built using the program EViews 9.

THE MODELS OF THE DEPENDENCE OF THE NON-OBSERVED ECONOMY IN MOLDOVA ON THE MACROECONOMIC INDICATORS

An analysis of the dynamics of and the share of the non-observed economy in GDP (calculated using the CDA) showed that over 21 years, this indicator decreased by 18.2 percentage points (Figure 2). According to the calculated trend line (logarithmic function), this indicator will decrease.

Figure 2.

Trend functions of the share of the non-observed economy in GDP



Source: *calculated by authors*

Note: *y – the share of the non-observed economy in GDP; x – time.*

The presence of multicollinearity is one of the obstacles to the efficient application of regression analysis. It arises in the case of the existence of close statistical relationships between exogenous variables. Using correlation analysis, you can identify and eliminate multicollinearity. For this purpose, a matrix of correlation coefficients between selected indicators was elaborated (Table 3).

Table 3

Matrix of correlation coefficients between exogenous variables

	agr	cons	road	x	m	tran	turn	eleu	eeuro	eusd	arate	erate	urate
agr	1	0.611	0.796	0.741	0.641	0.665	0.652	0.945	0.917	0.884	-0.740	-0.695	-0.693
cons	0.611	1	0.731	0.715	0.676	0.771	0.742	0.975	0.974	0.954	-0.765	-0.715	-0.641
road	0.796	0.731	1	0.726	0.592	0.606	0.465	0.760	0.714	0.659	-0.414	-0.343	-0.769
x	0.741	0.715	0.726	1	0.960	0.614	0.688	0.908	0.927	0.942	-0.644	-0.606	-0.606
m	0.641	0.676	0.592	0.960	1	0.555	0.693	0.830	0.881	0.937	-0.800	-0.665	-0.605
tran	0.665	0.771	0.606	0.614	0.555	1	0.861	0.707	0.661	0.603	-0.400	-0.338	-0.680
turn	0.652	0.742	0.465	0.688	0.693	0.861	1	0.652	0.642	0.644	-0.681	-0.645	-0.660
eleu	0.945	0.975	0.760	0.908	0.830	0.707	0.652	1	0.988	0.949	-0.737	-0.692	-0.797
eeuro	0.917	0.974	0.714	0.927	0.881	0.661	0.642	0.988	1	0.984	-0.782	-0.742	-0.789
eusd	0.884	0.954	0.659	0.942	0.937	0.603	0.644	0.949	0.984	1	-0.850	-0.815	-0.796
arate	-0.740	-0.765	-0.414	-0.644	-0.800	-0.400	-0.681	-0.737	-0.782	-0.850	1	0.994	0.667
erate	-0.695	-0.715	-0.343	-0.606	-0.665	-0.338	-0.645	-0.692	-0.742	-0.815	0.994	1	0.584
urate	-0.693	-0.641	-0.769	-0.606	-0.605	-0.680	-0.660	-0.797	-0.789	-0.796	0.667	0.584	1

Source: *authors' computations using EViews 9*

One indicator of multicollinearity between variables is the value of the pairwise correlation coefficient greater than 0.8. The high dependence is shown by such indicators as "Monthly gross average earnings" (eleu) and "Gross agricultural production" (agr), the correlation coefficient is ($r_{eleu,agr}$ = 0.945). In addition, the eleu factor correlates with such indicators as "Value of construction works" ($r_{eleu,cons}$ = 0.975), "Export" ($r_{eleu,x}$ = 0.908) and "Import" ($r_{eleu,m}$ = 0.830). A new set of indicators has been formed following the exclusion of indicators that are multicollinear with each other. Out of thirteen variables, eight remain for assessing the non-observed economy.

The calculation of the pairwise correlation coefficient between the endogenous variable and exogenous variables showed that "Gross agricultural production" has the greatest impact on the volume of the non-observed economy ($r_{lnoe,agr}$ = 0.970). "Value of construction works" is in second place in terms of influence ($r_{lnoe,cons}$ = 0.942). This is followed by export ($r_{lnoe,x}$ = 0.912) and import ($r_{lnoe,m}$ = 0.806). The correlation coefficient between imports and exports is high ($r_{x,m}$ = 0.960), so only one of them can be used when developing a model.

A fundamental task is to choose the type of function used in the simulation. A multiple linear regression analysis model is often used since this function is easy economically explain. However, the R-squared of the obtained single equation model was less than 0.7. Therefore, the authors applied the logarithmic function. The following three models of the level of the non-observed economy in value terms were obtained.

Model 1.

$$\ln(lnoe) = 3.107 + 1.126\ln(agr) + 0.213\ln(cons) - 0.488\ln(m) - 0.499\ln(turn) + 0.422\ln(eusd) - 0.203D08 \quad (1)$$

Model 2.

$$\ln(lnoe) = 4.258 + 1.194\ln(agr) + 0.480\ln(cons) - 0.365\ln(m) - 0.836\ln(turn) \quad (2)$$

Model 3.

$$\ln(lnoe) = 1.839 + 1.302\ln(agr) + 0.238\ln(cons) - 0.114\ln(x) - 0.687\ln(turn) \quad (3)$$

where:

lnoe – the level of the non-observed economy in value terms;
D08 – dummy variable (it takes value 1 in 2008; it takes value 0 in 2000-2007 and 2009-2020).

The authors chose a significance level of 5%. So, the critical level of the probability of rejecting the hypothesis H0, that the regression parameters are equal to zero, is 0.05. If the p-value is less than the established critical level, then the null hypothesis about the insignificance of the model coefficient is rejected, therefore, the coefficient is significant. In the case of model 1, variables ln(agr), ln(m), ln(turn), ln(eusd) and D08 turned out to be significant (Table 4). However, variable ln(cons) is not significant, so the authors reject model 1 and continue testing models 2 and 3.

Table 4

Testing the null hypothesis (the regression parameters are equal to zero) of models 1, 2 and 3

VARIABLES	MODEL 1		MODEL 2		MODEL 3	
	t-value	p-value	t-value	p-value	t-value	p-value
C	2.107	0.054	2.324	0.034	2.705	0.017
ln(agr)	12.358	0.000	10.552	0.000	7.806	0.000
ln(cons)	1.503	0.155	3.555	0.003	2.174	0.045
ln(m)	-3.216	0.006	-2.392	0.029	–	–
ln(x)	–	–	–	–	-2.360	0.033
ln(turn)	-2.756	0.016	-4.734	0.000	-3.605	0.002
ln(eusd)	2.454	0.028	–	–	–	–
D08	-2.432	0.029	–	–	–	–
Marginal level of the test		0.050		0.050		0.050

Source: *authors' computations using EViews 9*

Table 5 shows the results of testing the quality of the remaining two models. The best among them is model 2, as it has a higher adjusted R-squared and lower information criterion (Akaike, Schwarz, Hannan-Quinn), lower the standard error of the regression, and the residual sum of squares.

Table 5

Testing the quality of model 2 and model 3

	MODEL 2	MODEL 3
R-squared	0.985	0.980
Adjusted R-squared	0.982	0.975
S.E. of regression	0.094	0.109
Sum of squared residuals	0.142	0.190
Log likelihood	22.675	19.626
F-statistic	266.388	198.227
Prob. (F-statistic)	0.000	0.000
Akaike info criterion	-1.683	-1.393
Schwarz criterion	-1.435	-1.144
Hannan-Quinn criterion	-1.629	-1.339

Source: *authors' computations using EViews 9*

Testing the second model for autocorrelation in the residuals and heteroskedasticity showed that it doesn't have autocorrelation and heteroscedasticity (Tables 8 and 9).

According to Equation (2), an increase in "Gross agricultural production" by 1% will lead to a rising the level of the non-observed economy (NOE) by 1.19%, and a growth of 1% in the "Value of construction works" will lead to an increase in NOE by 0.48%. The following indicators have a negative impact on the level of the non-observed economy: import and turnover of goods. Growth in imports by 1% will carry to a decrease in NOE by 0.37%. Thus, the higher the import, the less profitable it is to engage in shadow business, since the market is saturated, there is no shortage.

Illegal import is much more difficult to implement than illegal export since it is necessary not only to hide the fact of smuggling when crossing the border but also to illegally sell products and hide the income received from the state. Illegal import schemes are much more complex than illegal export schemes.
As a result of econometric modelling of the dependence of the share of the non-observed economy in GDP on the macroeconomic indicators, the following four models were obtained.

Model 4.

$$\ln(snoe) = 6.609 + 0.124\ln(agr) - 0.254\ln(m) - 0.288\ln(turn) - 0.090D17 \quad (4)$$

Model 5.

$$\ln(snoe) = 6.265 + 0.116\ln(agr) - 0.238\ln(m) - 0.271\ln(turn) + 0.080\ln(urate) + 0.109D14 \quad (5)$$

Model 6.

$$\ln(snoe) = 6.977 + 0.086\ln(agr) + 0.070\ln(cons) - 0.306\ln(m) - 0.327\ln(turn) + 0.093\ln(urate) + 0.117D14 \quad (6)$$

Model 7.

$$\ln(snoe) = 4.986 + 0.227\ln(agr) - 0.128\ln(cons) - 0.167\ln(x) - 0.202\ln(turn) + 0.068\ln(urate) + 0.151D20 \quad (7)$$

where:

snoe – the share of the non-observed economy in GDP; *D14, D17, D20* – dummy variables.

As in the previous case, the significance level was set equal to 5%. Table 6 presents the results of testing the null hypothesis for models 4-7. The probability that the null hypothesis is true for the variables ln(agr), ln(cons), ln(urate) of model 6 and the variables ln(x), ln(turn), and ln(urate) of model 7 are greater than 0.05. Therefore, the authors reject models 6 and 7 and continue testing models 4 and 5.
Table 7 shows the results of testing the quality of model 4 and model 5. The quality of model 4 is higher than model 5 because it has a higher level of R-squared and adjusted R-squared, a lower level of information criteria and a lower level of the standard error of the regression, etc.

Table 6

Testing the null hypothesis of models 4, 5, 6 and 7

VARIABLES	MODEL 4		MODEL 5		MODEL 6		MODEL 7	
	t-value	p-value	t-value	p-value	t-value	p-value	t-value	p-value
C	12.790	0.000	9.824	0.000	7.321	0.000	5.258	0.000
ln(agr)	2.418	0.028	2.293	0.037	1.466	0.165	2.623	0.020
ln(cons)	–	–	–	–	1.005	0.332	-2.239	0.042
ln(m)	-6.175	0.000	-6.273	0.000	-3.943	0.002	–	–
ln(x)	–	–	–	–	–	–	-1.416	0.179
ln(turn)	-4.094	0.001	-3.973	0.001	-3.717	0.002	-2.129	0.051
ln(urate)	–	–	2.135	0.050	1.553	0.143	1.026	0.322
D14	–	–	2.167	0.046	2.293	0.038	–	–
D17	-2.392	0.029	–	–	–	–	–	–
D20	–	–	–	–	–	–	2.499	0.026
Marginal level of the test		0.050		0.050		0.050		0.050

Source: *authors' computations using EViews 9*

Table 7

Testing the quality of model 4 and model 5

	MODEL 4	MODEL 5
R-squared	0.951	0.943
Adjusted R-squared	0.935	0.928
S.E. of regression	0.047	0.049
Sum of squared residuals	0.033	0.039
Log likelihood	38.001	36.323
F-statistic	58.357	65.728
Prob. (F-statistic)	0.000	0.000
Akaike info criterion	-3.048	-2.983
Schwarz criterion	-2.749	-2.734
Hannan-Quinn criterion	-2.983	-2.929

Source: *authors' computations using EViews 9*

Testing model 4 for autocorrelation in the residuals and heteroskedasticity showed that it does not have autocorrelation and heteroscedasticity (Tables 8 and 9). The authors include a dummy variable for 2017, because all three factors, especially agriculture, recorded significant increases.

Table 8

Breusch-Godfrey Serial Correlation LM Test of model 2 and model 4

	MODEL 2	MODEL 4
	PROB.	PROB.
lag 1		
C	0.856	0.997
ln(agr)	0.895	0.994
ln(cons)	0.908	–
ln(m)	0.980	0.995
ln(turn)	0.850	0.999
D17	–	0.985
RESID(-1)	0.482	0.966
Prob. F(1, 15)	0.482	0.966
lag 2		
C	0.928	0.774
ln(agr)	0.953	0.827
ln(cons)	0.936	–
ln(m)	0.956	0.754
ln(turn)	0.935	0.808
D17	–	0.911
RESID(-1)	0.462	0.965
RESID(-2)	0.601	0.272
Prob. F(2, 14)	0.684	0.535

Source: *authors' computations using EViews 9*

Table 9

Heteroskedasticity Breusch-Pagan-Godfrey Test of model 2 and model 4

	MODEL 2	MODEL 4
	PROB.	PROB.
C	0.884	0.138
ln(agr)	0.439	0.525
ln(cons)	0.723	–
ln(m)	0.459	0.634
ln(turn)	0.648	0.266
D17	–	0.168
Prob. F(4, 16)	0.777	0.357

Source: *authors' computations using EViews 9*

According to model 4, the "Gross agricultural production" has a positive influence on the share of the non-observed economy in GDP, and the following indicators have a negative impact on the endogenous variable: import and turnover of goods.

CONCLUSIONS

This study revealed that the increase in the level of the non-observed economy is affected by the growth of "Gross agricultural production", "Value of construction works" and the decrease in import and turnover of goods. The authors did not include in the single equation models such indicators as the value of manufactured industrial production and turnover in retail trade of commodities due to the lack of data for 21 years, but the turnover of goods directly depends on these two variables.

It is difficult for the tax authorities to verify retailers' income, as they come directly from individual consumers. The high level of the non-observed economy has a negative impact not only on the level of tax collections but is also a factor directly limiting economic growth. Firms do not pay taxes on shadow activities and achieve significant cost reductions. Tax-hidden funds are used to cover losses from low labor productivity and allow firms to receive additional income to be more competitive than firms that do not practice shadow activities. As a result, low-performing informal players do not go out of business and do not allow more productive formal enterprises and organizations to increase their market share.

Thus, in the short term, informal enterprises win in a competition and provide informal employment. In the long term, they negatively affect economic growth and the population's well-being, which loses part of the pension. To reduce the level of the non-observed economy, it is necessary to eliminate the causes and conditions that give rise to it, which are in the economic, political, social, labor, and other spheres of public life.

Given that the turnover of goods and imports are factors influencing the non-observed economy, it is necessary for the government to reduce the volume of the shadow economy in both areas. It is necessary to combat the practice of false declarations, smuggling and corruption.

Combating the non-observed economy should be based on the principle of balancing stimulus and tightening measures (the stick and carrot principle). One way to reduce the shadow sector is to expand non-cash turnover. The most elusive shadow segment for the tax authorities (small retail sales and the provision of personal services) has to voluntary transition to non-cash payments.

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AN AUTO-REGRESSIVE INTEGRATED MOVING AVERAGE MODEL OF INFLATION IN MOLDOVA WITH SOME OBSERVATIONS ON THE INFLATION OUTLOOK

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ABSTRACT

The paper discusses the properties of Auto-Regressive Integrated Moving Average (ARIMA) models and proceeds to estimate a model for the monthly evolution of the annual inflation rate in Moldova from January 2013 to October 2021. The aim of the paper is to develop a model relying exclusively upon the historical evolution of inflation as an additional instrument for forecasting purposes. The estimated model explains close to 97 % of the monthly variation of the inflation rate over the model's estimation period and is used to generate forecasts of the monthly evolution of the annual inflation rate in short to medium term. The ARIMA-generated forecasts suggest that the acceleration of inflation which characterised the monthly evolution of the annual inflation rate in 2021 up to October 2021 will continue in the next four months, with the inflation rate peaking at 12 % in February 2022 and slowly decelerating from that point onwards towards the 5 % inflation target in the longer term. The paper concludes by suggesting areas for further work and briefly discussing the inflation outlook for the Moldovan economy, considering current international and domestic economic conditions. Natural areas for further work would be to regularly update the econometric estimates and forecasts of the estimated ARIMA model as the economy evolves through time. With regard to the inflation outlook, the analysis contained in the concluding section of the paper suggests that the future evolution of inflation is likely to be more pessimistic than the ARIMA-based generated forecast.

Keywords: *Auto-Regressive Integrated Moving Average models, Inflation, Moldova*

Articolul relevă proprietățile modelelor autoregresive integrate de medie mobilă (ARIMA) și prezintă un model de estimare a evoluției lunare a ratei anuale a inflației în Moldova din ianuarie 2013 până în octombrie 2021. Scopul lucrării îl reprezintă dezvoltarea unui model bazat în exclusivitate pe evoluția istorică a inflației ca instrument suplimentar de prognozare. Modelul estimat explică aproape 97 % din fluctuațiile lunare ale ratei inflației în perioada de estimare a modelului și este utilizat pentru a genera previziuni ale evoluției lunare a ratei anuale a inflației pe termen scurt și mediu. Prognozele generate de ARIMA sugerează că accelerarea inflației. care a caracterizat evoluția lunară a ratei anuale a inflației de la începutul anului 2021 până în octombrie 2021. va continua în următoarele patru luni, astfel, rata inflației atingând un vârf de 12 % în februarie 2022 și înregistrând o scădere lentă din acel moment spre ținta de inflație de 5 % pe termen lung. Articolul se încheie prin sugerarea domeniilor de lucru și discutarea pe scurt a perspectivelor inflaționiste pentru economia Republicii Moldova, ținând cont de condițiile economice internaționale și interne actuale. Activitățile ulterioare ar trebui să se axeze în mod firesc pe actualizarea sistematică a estimărilor și previziunilor econometrice ale modelului estimat ARIMA pe măsură ce economia evoluează în timp. În ceea ce privește perspectiva inflației, analiza cuprinsă în secțiunea finală a lucrării sugerează că evoluția viitoare a inflației ar putea să fie mai pesimistă decât prognoza generată de ARIMA.

Cuvinte cheie: *modele autoregresive integrate de medie mobilă, inflație, Moldova*

В статье представлены свойства интегрированной модели авторегрессии-скользящего среднего (ARIMA) и проводится оценка модели ежемесячной эволюции годового уровня инфляции в Молдове с января 2013 г. по октябрь 2021 г. Целью статьи является разработка модели, опирающейся исключительно на историческую эволюцию инфляции как дополнительного инструмента для прогнозирования. Расчетная модель объясняет почти 97 % месячных колебаний уровня инфляции в течение расчетного периода модели и используется для создания прогнозов месячного изменения годового уровня инфляции в краткосрочной и среднесрочной перспективе. Прогнозы составленные ARIMA предполагают, что ускорение инфляции, которое характеризовало ежемесячную динамику годового уровня инфляции с начала 2021 г. по октябрь 2021 г., продолжится в следующие четыре месяца, при этом уровень инфляции достигнет пика на уровне 12 % в феврале 2022 г. и с этого момента зарегистрирует

медленный спад до целевого уровня инфляции 5% в долгосрочной перспективе. Статья завершается предложением областей для дальнейшей работы и кратким обсуждением инфляционных перспектив молдавской экономики с учетом текущих международных и внутренних экономических условий. Естественными областями для дальнейшей работы было бы регулярное обновление эконометрических оценок и прогнозов модели ARIMA по мере развития экономики во времени. Что касается перспектив инфляции, анализ, содержащийся в заключительном разделе статьи, предполагает, что будущая эволюция инфляции, вероятно, будет более пессимистичной, чем прогноз, созданный на основе ARIMA.

Ключевые слова: *интегрированная модель авторегрессии-скользящего среднего, инфляция, Молдова.*

JEL Classification: *C22, E31, E37*
UDC: *330.4+336.748.12(478)*

INTRODUCTION

Auto-Regressive Integrated Moving Average (ARIMA) models are widely used in empirical work for analytical and forecasting purposes. The aim of this paper is to estimate an ARIMA model on the monthly evolution of the annual inflation rate in Moldova, use the estimated model to generate short to medium-term monthly forecasts of the annual inflation rate in Moldova and discuss further these forecasts taking into account the current economic conditions and trends, both domestic and international.

This research intends to develop a model of inflation relying exclusively upon the historical evolution of the monthly annual inflation rate as an additional instrument for short to medium term forecasting purposes. An additional empirical model to assist the forecasting of the inflation rate in Moldova will be useful given the importance of inflation forecasting for macroeconomic management in general and the conduct of monetary policy in particular.

The paper is organised as follows: Following a discussion section on the properties and estimation of ARIMA models, the paper presents the data to be used for the estimation. This is followed by a section which includes the econometric estimates of the ARIMA model and its forecasts. The paper concludes by suggesting areas for further work and discussing the inflation outlook for the Moldovan economy briefly.

ON ARIMA MODELS: A BRIEF LITERATURE SURVEY

ARIMA models are widely used for analytical and forecasting purposes. Though frequently a-theoretical ARIMA models have proved to be useful tools in order:

- *To provide insight and analyse the data-generating process of a particular time series; and*
- *To generate forecasts of the time series in question. In particular, the forecasts generated by ARIMA models are frequently used as benchmarks: the generated forecasts are taken into account and are combined with other economic indicators and additional empirical analysis of the structural characteristics of the economy under consideration and its external environment.*

ARIMA models stemmed from the work of Box and Jenkins (1970). They are linear models that incorporate two types of dynamic processes: an autoregressive process and a moving average process.

In more detail, for a time series variable, y_t:

1. An Auto-Regressive (AR) process is one where the current value of y_t is a function of its own past values and an error term, u_t:
$y_t = f(y_{t-1}, y_{t-2}, ...) + u_t$
2. A Moving Average (MA) process is one where the contemporaneous value of y_t is a function of past as well as contemporaneous values of the error term, u_t
$y_t = g(u_{t-1}, u_{t-2}, ...) + u_t$

The first step in developing an ARIMA model is to ensure that the time series that will be modelled is stationary or, in other words, that the series to be modelled by an ARIMA model does not contain a unit root, as it is well-known that a non-stationary time-series may give rise to spurious regressions. A time-series that follows a stationary process has the property that its mean, variance and autocorrelation structure is finite and constant over time.

Stationarity is tested through statistical tests. If the time series under investigation is not stationary, following the Box and Jenkins methodology, the first difference of the time series is taken, and the resulting time series is subsequently tested for stationarity. The differencing process is repeated until the resulting time series is stationary. The number of times the time series in question has to be differenced in order to arrive at a stationary series determines the order of integration of the ARIMA model.

An ARIMA model could be characterised by a vector of three numbers (p,d,q), where:

- ***p*** *refers to the number of lags in the AR process in the model;*
- ***d*** *refers to the order of integration (i.e. the number of times the time-series needs to be differenced to obtain a stationary series); and*
- ***q*** *is the number of lags in the MA process in the model.*

At the ARIMA model identification stage, the researcher also seeks to analyse briefly the property of the time series under investigation, including determining whether the dependent time series exhibits seasonality and identifying the order for the seasonal autoregressive and/or seasonal moving average terms.

The model's identification requires the exercise of informed judgement supplemented by diagnostic tools and tests. Graphs of the autocorrelation and partial autocorrelation functions are frequently employed to determine the number of lags in modelling the AR and/or the MA process in the specified ARIMA model. The autocorrelation and partial autocorrelation functions are summarised in the correlogram of the time series, which displays the autocorrelation and partial autocorrelation functions up to the specified number of lags. In particular:

- *the autocorrelation function displays the coefficients of correlation between a time series and lags of the same series, while*
- *by partial autocorrelation we refer to the correlation between a variable and a lag of itself that is not explained by the correlations of all lower-order-lags.*

It is well known that:

- *A pure AR process is characterised by a geometrically decaying autocorrelation function, while the partial auto-correlation function drops to zero after a number of lags. The spikes in the partial autocorrelation function are indicative of the AR order to be introduced in the model's specification;*
- *For a pure MA process: the number of spikes in the autocorrelation function is indicative of the MA order to be introduced in the specification. An MA process is characterised by a geometrically decaying partial autocorrelation function and an autocorrelation function that drops to zero after a few lags.*
- *If the correlogram of a time series is characterised by geometrically decaying autocorrelation and partial auto-correlation functions, this is indicative that a mixed AR and MA process may be the appropriate specification.*

Finally, one of the aims of the ARIMA model identification and selection process is to arrive at a model that:

1. *Is parsimonious, or as small as possible; while, at the same time,*
2. *Passes the diagnostic tests.*

A parsimonious ARIMA model is desirable because:

- *Including irrelevant time-lags in the model increases the coefficient standard errors (and therefore reduces their t-statistics).*
- *Models that incorporate large numbers of time-lags tend not to forecast well: these models are more likely to fit data-specific features of the data under estimation (thus explaining much of the random features in the data set rather than providing a better reflection of the underlying data generating process).*

In the estimation and testing steps of the model development, various descriptive statistics and statistical tests are employed to assist the analysis, model selection and validation. These also include information criteria used to compare different alternative specifications and balance the goodness of fit requirement with the need for a parsimonious (i.e. simple) specification.

Variants of ARIMA-type models have been used to analyse empirically certain aspects of the inflationary process in a number of economies and have proven to be useful instruments for analytical and forecasting purposes. The paper by Meyler et al. (1998) used ARIMA models to forecast inflation in Ireland. The article by Kelikume and Salami (2014) developed an ARIMA model and a Vector Auto-Regression model to forecast inflation in Nigeria. The study by Pintilescu et al. (2015) estimated a variant of a seasonal ARIMA model to empirically analyse Romania's inflation rate. The paper by Samrad et al. (2021) developed an ARIMA model to forecast the annual inflation rate in Iran. Within the context of the Moldovan economy, the paper by Mija et al. (2013) developed a Vector Auto-Regression model to evaluate the second round effects on core inflation.

DATA SET

The data set we use in our estimation and forecasting work is the monthly evolution of the annual growth rate of the Consumer Price Index in Moldova over the period from January 2013 to October 2021. The data source is the website of the National Bank of Moldova which reproduces the monthly estimates compiled by the National Bureau of Statistics of Moldova. The data exclude the Transnistrian region and are rounded to the first decimal place.

Table 1 below presents the data set used in our empirical work.

Table 1: Data set

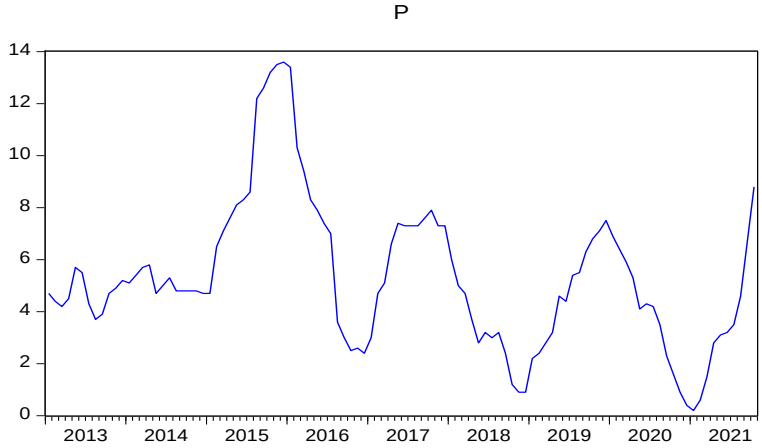
2013M01	4.7	2015M01	4.7	2017M01	3.0	2019M01	2.2	2021M01	0.2
2013M02	4.4	2015M02	6.5	2017M02	4.7	2019M02	2.4	2021M02	0.6
2013M03	4.2	2015M03	7.1	2017M03	5.1	2019M03	2.8	2021M03	1.5
2013M04	4.5	2015M04	7.6	2017M04	6.6	2019M04	3.2	2021M04	2.8
2013M05	5.7	2015M05	8.1	2017M05	7.4	2019M05	4.6	2021M05	3.1
2013M06	5.5	2015M06	8.3	2017M06	7.3	2019M06	4.4	2021M06	3.2
2013M07	4.3	2015M07	8.6	2017M07	7.3	2019M07	5.4	2021M07	3.5
2013M08	3.7	2015M08	12.2	2017M08	7.3	2019M08	5.5	2021M08	4.6
2013M09	3.9	2015M09	12.6	2017M09	7.6	2019M09	6.3	2021M09	6.7
2013M10	4.7	2015M10	13.2	2017M10	7.9	2019M10	6.8	2021M10	8.8
2013M11	4.9	2015M11	13.5	2017M11	7.3	2019M11	7.1		
2013M12	5.2	2015M12	13.6	2017M12	7.3	2019M12	7.5		
2014M01	5.1	2016M01	13.4	2018M01	6.0	2020M01	6.9		
2014M02	5.4	2016M02	10.3	2018M02	5.0	2020M02	6.4		
2014M03	5.7	2016M03	9.4	2018M03	4.7	2020M03	5.9		
2014M04	5.8	2016M04	8.3	2018M04	3.7	2020M04	5.3		
2014M05	4.7	2016M05	7.9	2018M05	2.8	2020M05	4.1		
2014M06	5.0	2016M06	7.4	2018M06	3.2	2020M06	4.3		
2014M07	5.3	2016M07	7.0	2018M07	3.0	2020M07	4.2		
2014M08	4.8	2016M08	3.6	2018M08	3.2	2020M08	3.5		
2014M09	4.8	2016M09	3.0	2018M09	2.4	2020M09	2.3		
2014M10	4.8	2016M10	2.5	2018M10	1.2	2020M10	1.6		
2014M11	4.8	2016M11	2.6	2018M11	0.9	2020M11	0.9		
2014M12	4.7	2016M12	2.4	2018M12	0.9	2020M12	0.4		

Source: *National Bank of Moldova reproducing data compiled by the National Bureau of Statistics of Moldova*

Figure 1 portrays the evolution of the above data set graphically. It is notable that from January 2021 onwards the inflation rate has accelerated throughout the period up to and including October 2021.

Figure 1:

Graph of the monthly evolution of the annual inflation rate in Moldova



Source: *National Bank of Moldova reproducing data compiled by the National Bureau of Statistics of Moldova*

Monetary policy in Moldova aims at retaining the inflation rate in the economy within a corridor of plus/minus 1.5 % around the 5 % inflation target.

MAIN RESULTS: ECONOMETRIC ESTIMATES AND FORECASTS

We first establish that the time series we will be using in our estimation and forecasting work is stationary. The stationarity test reported in table 2 below indicates that the probability that the time series under investigation has unit root is only around 5 %.

Table 2: Stationarity test

Null Hypothesis: P has a unit rootv
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.878840	0.0513
Test critical values:	1% level	-3.495021	
	5% level	-2.889753	
	10% level	-2.581890	

**MacKinnon (1996) one-sided p-values.*
Source: *EViews-generated estimates on the data set*

The absence of a unit root implies that we may fit an ARIMA model to the actual data set with no need to difference the time series under consideration prior to the estimation. It is well-known that the monthly evolution of inflation in Moldova is likely to exhibit significant seasonality due to a large extent to the behaviour of the food component of the index which varies in line with the supply conditions over the year.

Our econometric work suggests that a simple (2,0,1) ARIMA model augmented with SAR(12) and SMA(12) terms to capture the inherent seasonality of the time series under consideration provides a very good fit over the data set.

Table 3 below provides the least squares estimates of our preferred ARIMA model.

Table 3: Regression results

Dependent Variable: P
Method: Least Squares
Sample (adjusted): 2014M03 2021M10
Included observations: 92 after adjustments
Convergence achieved after 11 iterations
MA Backcast: 2013M02 2014M02

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.258628	0.502349	10.46807	0.0000
AR(1)	1.726945	0.146173	11.81436	0.0000
AR(2)	-0.749913	0.143360	-5.230959	0.0000
SAR(12)	-0.292854	0.110904	-2.640600	0.0098
MA(1)	-0.467144	0.187500	-2.491437	0.0146
SMA(12)	-0.888992	0.030036	-29.59724	0.0000
R-squared	0.969843	Mean dependent var		5.423913
Adjusted R-squared	0.968090	S.D. dependent var		3.050072
S.E. of regression	0.544848	Akaike info criterion		1.686375
Sum squared resid	25.52992	Schwarz criterion		1.850839
Log likelihood	-71.57323	Hannan-Quinn criter.		1.752754
F-statistic	553.1487	Durbin-Watson stat		2.001435
Prob(F-statistic)	0.000000			

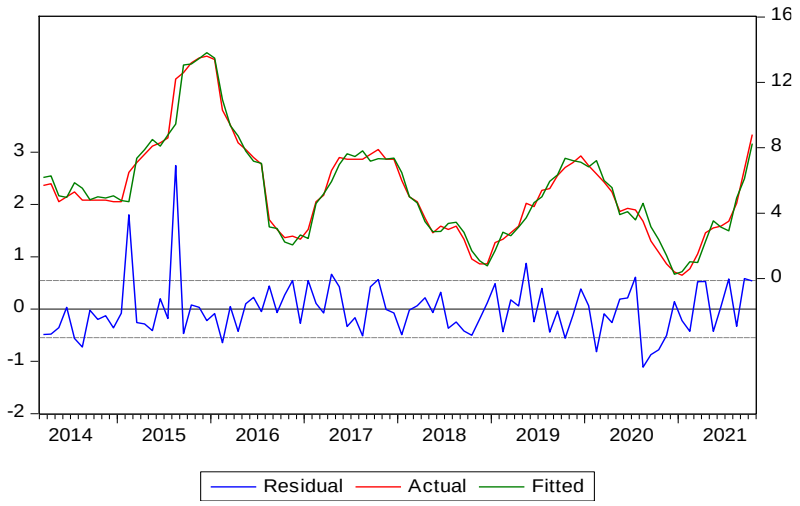
Source: *EViews-generated estimates*

The data sample used for the estimation reported in table 3 covers the period from March 2014 to October 2021 as it must take into account the lagged structure of our preferred ARIMA model. It is notable that all the individual terms of the regression equation reported in table 3 are statistically significant, while the R-squared statistic suggests that the regression explains close to 97 % of the monthly variation of the annual inflation rate over the period of the estimation.

Figure 2: Provides the actual, fitted and residual estimates of the above regression

Figure 2:

Actual, fitted and residuals graph of the regression reported in Table 3

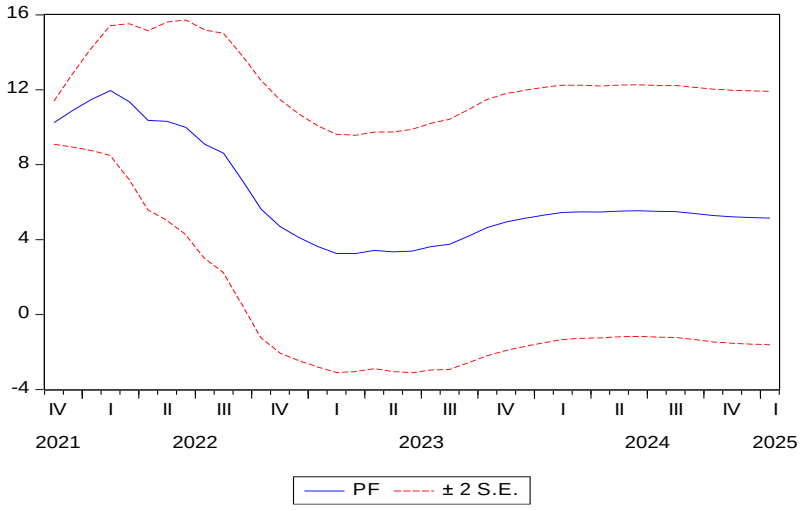


Source: *EViews-generated estimates*

We use our ARIMA model to generate forecasts of the monthly evolution of the annual inflation rate from November 2021 to January 2025. Figure 3 provides the evolution of the ARIMA-generated forecast over the above period, while table 4 presents the results rounded to the first decimal point for the next 12 months. We emphasise the short-term forecasts as it is well-known that ARIMA models are more efficient for short to medium-term forecasting.

Figure 3:

Figure of the forecasted evolution of the inflation rate



Source: *EViews-generated estimates*

The generated forecasts suggest that the acceleration of inflation which characterised the evolution of inflation in the first ten months of 2021 will continue for the next four months.

Table 4:

Forecasts of the monthly evolution of the annual inflation rate over the period November 2021 to October 2021

2021M11	10.2	2022M05	10.3
2021M12	10.9	2022M06	10.0
2022M01	11.5	2022M07	9.1
2022M02	12.0	2022M08	8.6
2022M03	11.4	2022M09	7.2
2022M04	10.4	2022M10	5.6

Source: *EViews-generated estimates*

The ARIMA forecasts reported in Graph 3 and Table 4 above suggest that the annual inflation rate in Moldova will peak at 12 % in February 2022 and slowly decelerate from that point onwards towards the 5 % inflation target in the longer term. We will discuss further the inflation outlook for the Moldovan economy in the next and final section of the paper.

CONCLUSION:

Areas for further work and discussion on the inflation outlook in Moldova

A natural area for further work would be to update the ARIMA econometric estimates reported in this paper and the model's forecasts as the economy evolves through time in the future and use the results for monitoring and analytical purposes.

As discussed in our literature review section above, the forecasts generated by ARIMA models should be taken as benchmarks that need to be adjusted taking into account other relevant economic indicators to arrive at a forecast reflecting professional judgement.

It is notable that under current conditions, inflation is likely to accelerate in the months to come in Moldova. The inflation outlook internationally has deteriorated recently, though most analysts expect that the acceleration of inflation will be only temporary. Recent economic developments are also likely to contribute to this acceleration in inflation. These include the recent increase in the international and domestic price of food (whose share is very significant in the Consumer Price Index basket in Moldova) the international and domestic price of energy (a key input into the production process - and thus a cost-push factor in the short term), as well as the increases in salaries and pensions in Moldova, with the latter likely to increase domestic demand in the economy. The inflation expectations will also influence the future evolution of inflation in the Moldovan economy and the monetary policy and fiscal policy stance. With regard to expectations, while there are no widely available surveys of inflation expectations in the Moldovan economy, the risk here is that, with the ongoing acceleration of inflation experienced recently, expectations of a more inflationary environment may become entrenched and contribute to future inflation.

A very important variable that influences the evolution of prices is the conduct of monetary policy. It is notable that the last monetary policy decision of October 29 has retained the monetary policy instruments unchanged. Thus, the current level of the base interest rate is 5.5 %, while interest rates on overnight loans and overnight deposits are at the level of 7.5 % and 3.5 %, respectively. However, over the three previous monetary policy decisions, interest rates have been tightened in all three

policy decisions to stem the inflationary process underway. According to the latest monthly annual inflation rate of October 2021, the annual inflation rate amounts to 8.81%, which renders the current level of the policy interest rates mentioned above negative in real terms. The next monetary policy decision is due to take place on 3 December 2021. In addition to the impact of the current and future monetary policy decisions, the level of inflation in the future will be partly determined by the fiscal stance and the impact of the budget on aggregate demand in the economy. At the time of writing this article, the annual budget for 2022 was not yet finalised.

To conclude, the ARIMA estimates reported in the previous section suggest that inflation may accelerate in the short term and gradually decelerate from a point onwards make sense. It should be emphasised that the ARIMA-based estimates provide a benchmark evolution of inflation solely based on existing trends and the historical evolution of the inflation rate. The actual evolution of inflation in the future will reflect the joint impact of the evolution of a number of variables over the forecasting period. It is notable that the general economic environment, both domestic and international, may exacerbate the inflationary process underway and/or possibly its duration. It comes as no real surprise that the latest inflation forecast by the National Bank of Moldova is more pessimistic than our ARIMA estimated forecasts. In particular, the National Bank of Moldova foresees the inflation rate to accelerate in the months to come and peak at close to 15 % in the third quarter of 2022 before decelerating back towards the 5 % inflation target by the third quarter of 2023 (National Bank of Moldova, 2021). Compared to the National Bank of Moldova's forecast, our ARIMA-based forecast suggests that inflation in Moldova will peak earlier and at a slightly lower rate, while the longer term evolution of inflation is broadly similar in both forecasts. Given the importance of inflation for economic welfare, the maintenance of macroeconomic stability and the setting of economic policy, it is worth keeping the evolution of the inflation rate and relevant economic variables under review.

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ANALYSIS OF FINANCIAL ASSISTANCE FROM INTERNATIONAL FINANCIAL INSTITUTIONS TO MOLDOVA

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ABSTRACT

The article considers the financial assistance of international financial institutions (the International Monetary Fund and the World Bank) to Moldova in their partnership process. The relevance of the study is determined by the objective need to use this financial assistance to solve urgent financial and economic problems and implement an effective economic policy of Moldova. The purpose of the article is to analyze the financial assistance of International Financial Institutions to Moldova to assess the current state and prospects for developing their financial relations. The information base of the research consists of theoretical and methodological scientific studies of foreign and Moldovan economists devoted to the subject under consideration; information materials of official websites of financial organizations.

It is shown that for the entire period of financial support of Moldova by the International Monetary Fund, almost all special credit mechanisms have been implemented. Since 1993, the World Bank has implemented and is financing 118 different projects (90 completed, 18 active and 7 under development). Agriculture accounts for the largest number of projects financed by the bank. It is revealed that the country's debt and overdue obligations to International Financial Institutions have an upward trend, which is due to the crises and financial instability of 2008 and 2019. The continuation of such a trend in the future may lead to certain financial and economic problems if the financial assistance received does not lead to significant development of the Moldovan economy.

Keywords: *International financial institutions, international finance, international financial assistance, emerging markets, economic crisis.*

Articolul relevă asistența financiară acordată de Instituțiile financiare internaționale (Fondul Monetar Internațional și Banca Mondială) Moldovei în procesul de cooperare în calitatea lor de parteneri. Relevanța studiului este determinată de necesitatea obiectivă de a utiliza această asistență pentru a rezolva problemele financiare și economice stringente ale țării și a promova o politică economică eficientă. Scopul articolului este de a analiza asistența financiară acordată de instituțiile financiare internaționale Moldovei pentru a evalua starea actuală și perspectivele de dezvoltare a relațiilor cu acestea. Articolul se bazează pe studii științifice teoretice și metodologice ale economiștilor străini și moldoveni, axate pe problematica în cauză, materiale informative ale site-urilor web oficiale ale organizațiilor financiare.

Pe toată perioada sprijinului financiar acordat Moldovei de către Fondul Monetar Internațional au fost implementate aproape toate mecanismele speciale de creditare existente. Din 1993, Banca Mondială a finanțat și continua să finanțeze 118 proiecte diferite (90 au fost finalizate, 18 sunt active și 7 în curs de elaborare). Cel mai mare număr de proiecte finanțate de Bancă revine agriculturii. Datoria și obligațiile restante ale țării față de instituțiile financiare internaționale au o tendință ascendentă, determinată de crizele și instabilitatea financiară din anii 2008 și 2019. Continuarea acestei tendințe în viitor se poate solda cu anumite probleme economice, dacă asistența financiară nu va contribui la o dezvoltare semnificativă a economiei moldovenești.

Cuvinte-cheie: *instituții financiare internaționale, finanțe internaționale, asistență financiară internațională, piețe emergente, criză economică.*

В статье рассматривается финансовая помощь международных финансовых институтов (Международного валютного фонда и Всемирного банка) Молдове в рамках сотрудничества. Актуальность исследования определяется объективной необходимостью использования оказанной финансовой помощи для решения неотложных финансово-экономических проблем и проведения эффективной экономической политики в Молдове. Цель статьи является анализ

финансовой помощи, оказанной международнмих финансовыми институтами Молдове, для оценки современного состояния и перспектив развития их финансовых взаимоотношений. Статья основывается на теоретических и методологических научных исследованиях зарубежных и молдавских экономистов, посвященных рассматриваемой тематике, информационных материалах официальных сайтов финансовых организаций.

Следует отметить, что за время финансовой поддержки Молдовы Международным валютным фондом были использованы практически все специальные кредитные механизмы. Начиная с 1993г. Всемирный банк финансировал 118 различных проектов (90 были завершены, 18 находятся на стадии реализации и 7 - на стадии разработки). Наибольшее количество профинансированных Банком проектов приходится на сельское хозяйство. Выявлено, что задолженность и просроченные обязательства страны перед международными финансовыми институтами имеют отчетливую тенденцию к повышению, которая обусловлена кризисами и финансовой нестабильностью 2008 и 2019 гг. Сохранение такой тенденции в будущем может привести к определенным финансово-экономическим проблемам, если полученная финансовая помощь не будет способствовать значительному росту экономики Молдовы.

Ключевые слова: *Международные финансовые институты, международные финансы, международная финансовая помощь, развивающиеся рынки, экономический кризис.*

JEL Classification: *E69, F21, F33, F35.*
UDC: *339.726+339.732+339.727.3*

INTRODUCTION

In modern conditions of the global economic world order, the International Financial Institutions (IFI) play an important role. They are now a key element of the international financial system. Significant amounts of financial resources, scientific and economic potential and international prestige allow IFIs to have a significant impact on the economic development of many countries and regions of the world. The article deals with the main world IFIs: the International Monetary Fund (IMF) and the World Bank Group (WB).

Moldova, like other emerging market economies, is in the process of integrating into the international financial system. Its membership in the structures of IFIs makes it possible to use the financial resources to intensify this process. The global economic crisis of 2008 and the economic consequences of the COVID-19 pandemic have caused serious challenges, both for the entire system of the global world economy and its financial component. During the period of crisis, countries with developing market economies find themselves in a very difficult financial and economic situation. In this regard, to solve the urgent financial and economic problems that have arisen and to conduct an effective financial and economic policy for the development of its economic system, the Moldova objectively needs financial assistance from IFIs.

LITERATURE REVIEW

Foreign and Moldavian economists devoted their scientific works to the problems related to some aspects of the subject under consideration in this article. In the article (Kregel, 2018), special attention is paid to offsetting the lack of domestic savings with external financing in the form of soft loans as part of official assistance from international financial institutions. It is shown that the financing of economic development should be carried out through the comprehensive use of national financial institutions and the stimulation of employment in domestic manufacturing and export-oriented industries. The essence of foreign direct investment was analyzed by Dunning (1988) and Markusen (2000). Various aspects of financial assistance to developing countries in order to promote their economic and social development, as well as to expand the mechanism for their concessional lending

to the World Bank, are considered by the US Congress in a study (Congress U.S., 2020). The role of the World Bank in promoting participatory budgeting (PB) with partners is discussed by Goldfrank (2012). WB is shown to have little effect on PB outcomes in different countries since there is no way to control many influencing factors. Nevertheless, there is great practical potential in the implementation of PB procedures. Vilpišauskas (2019) studied the strategies and approaches of the main International Financial Institutions — the International Monetary Fund and the World Bank to reforms in the Eastern Partnership countries (Belarus, Moldova and Ukraine). It is noted that in addition to the traditional recommendations for fiscal consolidation and structural reforms, IFIs in these countries are focusing on reforms in the most corrupt sectors — banking and energy. The article by Lopotenco (2020) focuses on the vulnerability of the economy of Moldova and especially its financial system to the economic crisis caused by the COVID-19 pandemic. It is revealed that this vulnerability is mainly related to the specifics of the country's economy (small, open economy, with a constant current account deficit and a strong dependence on international financial flows). The study conducted by Stratan (2020) analyzes the role and approach of the International Monetary Fund and the World Bank in developing and supporting Moldova to overcome the COVID-19 crisis. It is shown that these organizations have made an urgent contribution to provide emergency financial assistance to mitigate the economic consequences of COVID-19, especially to stabilize the country's balance of payments. The role of international financial flows in stimulating the economic growth of Moldova was analyzed by Железнова, Хынку (2011).

RESEARCH METHODS

As a practical basis, the article uses the scientific works of Moldovan and foreign scientists on international financial flows and investments. The methodological basis of the study includes: causal relationships of the phenomenon under study, mechanisms and financial flows of Moldova within the framework of financial assistance provided by the IMF and the WB; statistical methods of data analysis (quantitative, qualitative, comparative). The charts presented in this article are implemented in Excel. The source of factual data on IFI financial assistance to Moldova is the official websites of the IMF and WB. The source of the country's financial and economic data is the official website of the National Bank of Moldova.

RESEARCH RESULTS

Currently, Moldova has the following agreements with the IMF on special lending facilities (National Bank of Moldova, 2021):

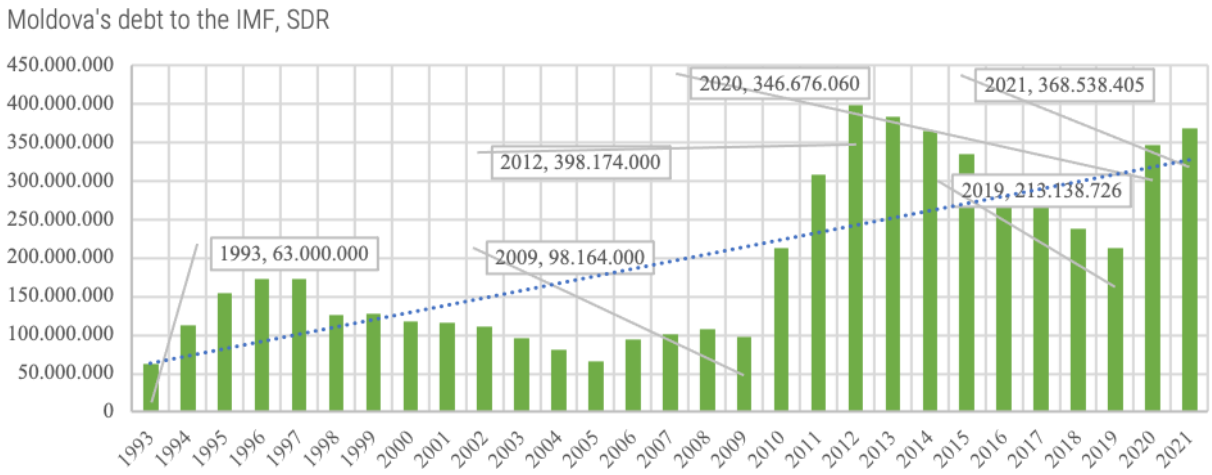
- *mechanism of compensatory and reserve financing (Compensatory and Contingency Financing Facility, CCFF);*
- *a systemic transformation mechanism for financing structural transformations (Systemic Transformation Facility, STF);*
- *Stand-by agreement (SBA) — for certain purposes agreed with the IMF;*
- *an extended financing mechanism (Extended Fund Facility, EFF) — to provide funds for long periods and in larger amounts in relation to quotas than is provided for in the country's usual credit shares. The basis for granting a loan is a serious violation of the balance of payments;*
- *an extended credit facility (Extended Credit Facility, ECF) provided on concessional terms in order to reduce poverty and promote economic growth;*
- *concessional lending under the Rapid Financing Instrument (RFI) and the Rapid Credit Facility (RCF).*

In connection with the socio-economic crisis associated with the COVID-19 pandemic, for low-income countries, including Moldova, in 2020, the IMF opened access to concessional lending under the Rapid Financing Instrument (RFI) and the Rapid Credit Facility (RCF) (IMF, 2021a).

It should be noted that the ECF and EFF lending mechanisms are used to eliminate a serious imbalance in the balance of payments, as well as to reduce poverty and promote economic growth. At the same time, these credit facilities have been used by the IMF regularly for lending to Moldova since 1996. The last lending under these facilities was made on 20.12.2021 (IMF, 2021a). That is, from 1996 to the present, the problem of balance of payments violations and poverty reduction in Moldova has not been finally resolved. During the entire period of financial support to Moldova, starting from 1993, the IMF has been involved in almost all special credit mechanisms. Also, the IMF has carried out annual consulting in the country in the field of financial and economic policy, including the central bank's policy.

Let's consider the dynamics of Moldova's debt on the IMF loan since 1993. Figure 1 shows the graph of changes in the debt on the IMF loan of Moldova in SDR from 1993 to 2021 (IMF, 2021b).

Figure 1.



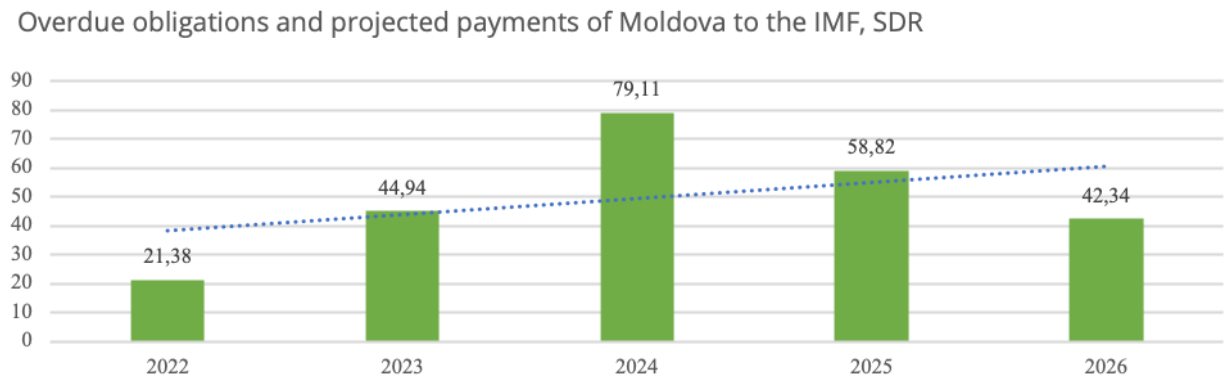
Change in the total debt of Moldova under the IMF loan
Source: *developed by the author according to the IMF*

The data in Figure 1 show that the total debt of Moldova since 1993 on various IMF loans has an upward trend (63 million SDR in 1993, 346.676 million SDR and 368.538 million SDR in 2020 and 2021, respectively). The consequences of the global economic crisis of 2008 affected the financial and economic situation of the country — the debt to the IMF increased sharply: from 98,164 million SDR in 2009 to 398,174 million SDR in 2012 (the maximum for the entire time of partnership with the IMF). The economic and social consequences of the COVID-19 pandemic have led to a significant increase in Moldova's debt to the IMF compared to pre-crisis 2019. As of 31.12.2021, the country's debt on IMF loans reached SDR 368.538 million (about 516 million US dollars) (IMF, 2021b), which is less than its maximum value in 2012, but over 3.7 times more than in 2009. Thus, the data in Figure 1 demonstrate that during the periods of crisis and financial instability in 2008 and 2019, to solve the urgent financial and economic problems of Moldova and implement a policy to stabilize its economic system, the IMF has dramatically increased its financial assistance to the country. The growth of this financial assistance was reflected by a significant increase in the total debt of Moldova to the IMF after 2008 and 2019 and the preservation of its overall upward trend.

At the same time, the volumes of overdue obligations and projected payments of the country to the IMF as of 02/28/2022 also have an upward trend (Figure 2) (IMF, 2021c). The maximum volume of payments is projected for 2024 — 79.11 million SDR.

Figure 2.

Change in the volume of overdue obligations and projected payments of the country to the IMF



Source: *developed by the author according to the IMF*

Such a significant amount of payments on overdue obligations means that the country may face certain economic and financial problems in the future. Moreover, if borrowing from the IMF does not lead to significant development of Moldova's economy, these problems will grow every year. Therefore, the financial resources received by the country from the IFI should be used for its economy with maximum efficiency.

Significant support to Moldova is provided by the World Bank Group, which from 11.03.1993 to 05.11.2021 took and is taking part in financing 118 different projects (The World Bank Group, 2021a). The total amount of funding for these projects amounted to 2,013.66 million US dollars, including:

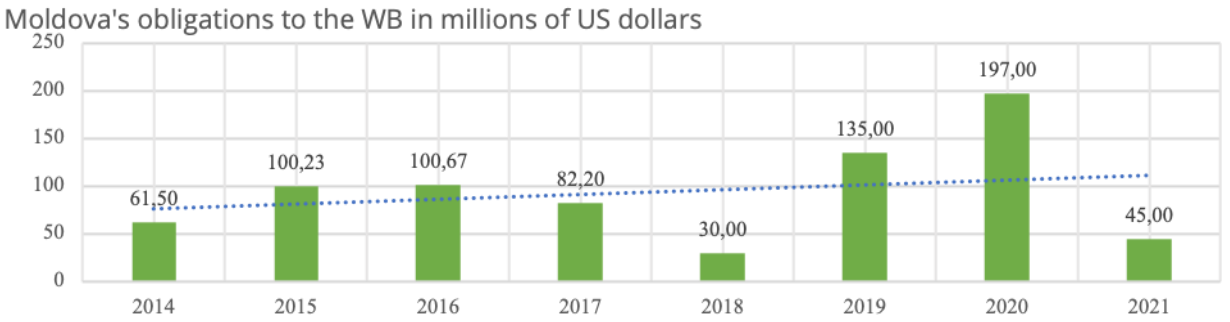
- *90 completed projects — 1,192. 26 million US dollars;*
- *18 active projects — 636.58 million US dollars;*
- *7 projects under development — 184.82 million US dollars.*
- *3 cancelled projects.*

Accordingly, the World Bank has allocated 821.4 million US dollars for 7 projects under development and 18 active projects (25 projects in total) implemented over the past 9 years. Moreover, totally 1,192.26 million US dollars were spent on all 90 completed projects over 19 years. That is, over the past 9 years, the intensity of the World Bank's project financial assistance to the country has sharply increased.

Figure 3 shows data on the obligations of Moldova to the World Bank Group from 2014 to October 2021 (in millions of US dollars) (The World Bank Group, 2021b).

Figure 3.

Obligations of Moldova for financial years to the World Bank Group



Source: *developed by the author based on data from The World Bank Group*

The diagram in Figure 3 shows that the lending of projects in Moldova by the World Bank Group has increased significantly since the beginning of the COVID-19 crisis compared to previous years. Currently, the bulk of the WB's financial resources is directed to the implementation of urgent medical projects and projects related to the elimination of the consequences of the socio-economic crisis from the COVID-19 pandemic. This makes it possible for the Government not to divert significant financial resources from other important socio-economic programs.

The number of projects by category of economic topics financed by the World Bank Group in Moldova from 11.03.1993 to 23.04.2021 are presented in Table 1 (The World Bank Group, 2021c).

Table 1

Number of projects in Moldova by category of economic topics funded by the World Bank Group

World Bank projects on themes of economics	Number of projects
Rural services and infrastructure	18
State-owned enterprise restructuring and privatization	9
Public expenditure, financial management and procurement	9
Micro, Small and Medium Enterprise support	9
Rural markets	10
Administrative and civil service reform	10
Rural policies and institutions	11
Education for all	11
Regulation and competition policy	15
Climate change	16
TOTAL	**118**

Source: *developed by the author based on data from The World Bank Group*

The data in Table 1 show that the largest number (39) of World Bank-funded projects falls on agriculture, a key sector of the Moldovan economy. In second and third place are projects related to climate change (16) and regulation of competition policy (15). The number of other projects financed on economic topics is approximately equal.

CONCLUSIONS

A study of the financial assistance provided by the IFI to Moldova showed that the country's financial cooperation with the International Monetary Fund and the World Bank Group is carried out in all financial and economic aspects that are in the assets of these organizations. It has been established that all the main special credit mechanisms used by the IMF are involved in this process, and the World Bank Group has participated and is participating in lending 118 projects on various topics since 1993. The largest number of credited projects (39) falls on agriculture, a key sector of the Moldovan economy. At the same time, over the past 9 years, the intensity of the World Bank's project financial assistance to the country has increased dramatically. It was revealed that the IMF's financial assistance is regularly provided to reduce poverty and promote economic growth, as well as to eliminate the country's balance of payments deficit caused by unfavorable changes in the structure of its economy. That is, since the beginning of financial cooperation between Moldova and the IMF, this situation has not changed for the better. The data on the dynamics of the total volume of debt to IFIs, overdue obligations and projected payments of Moldova to the IMF allow us to conclude that their upward trend is due to the periods of crisis phenomena and financial instability in 2008 and 2019. The continuation of this trend in the future may lead to certain economic and financial problems if borrowing from IFIs does not lead to significant development of the Moldovan economy.

In this regard, it would be economically feasible for the IMF and the WB to allocate financial resources on a permanent basis to improve the financial and economic stability of Moldova, in particular, to eliminate the problem areas of key sectors of its economy (these include the agricultural and banking sectors). Improving the structure of the key sectors of the Moldovan economy will have an impact on the entire economic system of the country as a whole and its economic stability. Thus, the results of financial cooperation with IFIs and their role in the economic development of Moldova could be much more significant if the specifics of its economic system are taken into account, and the efficiency of using the financial resources of these organizations is increased.

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EFFICIENCY OF OPERATION OF AGRARIAN HUMAN CAPITAL

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ABSTRACT

The article substantiates the identification of a specific form of human capital – agrarian and gives its author's interpretation. In determining its quantitative value, the advantages of using the income assessment method in comparison with the cost (investment) approach are proven. The latter circumstance is the basis for the development of methods to assess the effectiveness of its functioning in the agrarian sphere, based on the acme technology. The use of the acmeological approach is conditioned by the necessity of a complex analysis of the process of human capital formation in the agricultural sector of Belarus. This approach considers an individual's creative and purposeful possibilities and achievements. A system of interrelated indicators, which allows to determine the effectiveness of the use of agrarian human capital, is proposed. The main aim of the research is to develop a methodical approach to evaluate the efficiency of the functioning of agrarian human capital. The article was prepared with the use of general scientific research methods and private approaches to solving problems. In particular, the methodology of analysis, synthesis, graphic and tabular methods were used. Practical testing of the proposed assessment methodology indicates a decrease in the efficiency of functioning of agrarian human capital. This is due to the prevailing dynamics of growth of quantitative indicators compared to qualitative parameters. The proposed methodological approach to assessing the effectiveness of the functioning of agrarian human capital can be used by the representatives of management bodies, researchers, to develop program documents to form state agrarian and regional policy.

Keywords: *agrarian human capital, cost, efficiency, functioning, acmeological approach, productivity.*

Articolul fundamentează identificarea unei forme specifice a capitalului uman, și anume a capitalului uman agrar și prezintă viziunea autorului asupra acestuia. La determinarea valorii sale cantitative au fost relevate avantajele utilizării metodei de evaluare a veniturilor în comparație cu metoda de evaluare a costurilor (investițională). Aceasta din urmă se află la baza metodologiei de evaluare a eficienței funcționării sale în sectorul agrar, bazată pe tehnologia acme. Utilizarea abordării acmeologice a fost determinată de necesitatea analizei complexe a procesului de formare a capitalului uman în sectorul agrar din Belarus. Această abordare ia în considerare abilitățile edificatoare și creativeale individului, capacitatea acestuia de a-și atinge scopurile propuse. Se propune un sistem de indicatori interrelaționați, care permite determinarea eficacității utilizării capitalului uman agrar. Scopul principal al cercetării constă în dezvoltarea unei abordări metodologice pentru evaluarea eficienței funcționării capitalului uman agrar. În procesul de elaborare a articolului au fost utilizate metode științifice generale de cercetare, abordări particulare de rezolvare a sarcinilor. În special, au fost aplicate metode de analiză, sinteză, metode grafice, tabulare. Testarea practică a metodologiei de evaluare propusă denotă o scădere a eficienței funcționării capitalului uman agrar. Acest lucru este condiționat de dinamica de creștere predominantă a indicatorilor cantitativi în comparație cu parametrii calitativi. Abordarea metodologică propusă pentru evaluarea eficienței funcționării capitalului uman agrar poate fi utilizată de reprezentanții organelor guvernamentale, de cercetători, pentru elaborarea documentelor de politici, care vizează formarea politicii agrare și regionale de stat.

Cuvinte cheie: *capital uman agrar, cost, eficiență, funcționare, abordare acmeologică, productivitate.*

Аннотация. В статье обосновано выделение специфической формы человеческого капитала – аграрного и дано его авторское трактование. При определении его количественной величины доказаны преимущества использования доходного способа оценки в сравнении с затратным (инвестиционным) подходом. Последнее обстоятельство заложено в основу разработки методики оценки эффективности его функционирования в аграрной сфере, базирующейся на акметехнологии. Использование акмеологического подхода обусловлено

необходимостью комплексного анализа процесса образования человеческого капитала в аграрном секторе Беларуси. Этот подход учитывает созидательные, творческие возможности и целедостижения индивида. Предложена система взаимосвязанных показателей, которая позволяет определить результативность использования аграрного человеческого капитала. Основной целью проведенных исследований является разработка методического подхода оценки эффективности функционирования аграрного человеческого капитала. Статья подготовлена с использованием общенаучных методов исследования, частных подходов решения поставленных задач. В частности, нашли применение методология анализа, синтеза, графического, табличного способов. Практическая апробация предложенной методики оценки свидетельствует о снижении эффективности функционирования аграрного человеческого капитала. Это обусловлено превалирующей динамикой роста количественных индикаторов в сравнении с качественными параметрами. Предложенный методический подход оценки эффективности функционирования аграрного человеческого капитала может быть использован представителями органов управления, исследователями для разработки программных документов, нацеленных на формирование государственной аграрной и региональной политики.

Ключевые слова: *аграрный человеческий капитал, стоимость, эффективность, функционирование, акмеологический подход, продуктивность.*

JEL Classification: *B41, C13, C18, E22, E24*
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INTRODUCTION

The formation of a knowledge-intensive economy is conditioned by the necessity of increasing the human capital in the composition of the national wealth. In modern conditions, this resource is characterized by its inexhaustibility and renewability and predetermines the prospects and directions of development not only of the Republic of Belarus, but also of the countries of Eastern Europe. One of the engines of sustainable development of these states is the agricultural sector, which provides a high level of food security and sustained growth in exports. The preservation of the existing socio-economic trends and the creation of conditions for progressive growth are conditioned by the state and effectiveness of the use of human capital in the agro-industrial complex of these countries. The limited resource provision of the agrarian sector, specifics of its functioning, insufficient investment resources actualize the task of searching new ways of innovative transformations of the countries of Eastern Europe. In this connection, the improvement of methodological foundations for assessing the functioning efficiency of agrarian human capital is an objective prerequisite for finding reserves and determining the directions of sustainable socio-economic development of the countries of the Eastern Commonwealth.

ANALYSIS OF RECENT STUDIES AND PUBLICATIONS

Theoretical and methodological issues of human capital development management in the agrarian sphere were addressed by the leading researchers in Belarus and abroad (Гусаков, 2020; Бельский, Тригубович, 2017; Кристиневич, 2017; Богатырева, 2018; Латов, 2021; Tsaurkubule, 2016; Schultz, 1960; Becker, 1962). The variety of methodological approaches to determining the quantitative value of human capital generates a variety of methods for assessing the effectiveness of its functioning (Гусаков, 2021; Габидулин, Киршин, Лукин, 2020). The lack of a single methodological solution provokes a multivariate interpretation of the obtained results. The problem is complicated by the lack of practical methodological developments in determining the performance of human capital, taking into account industry specifics (Воронин, Чупина, Воронина, 2018). Despite the wide coverage of the

issues of functioning and development of human capital in the open press, the problems of capitalization of the agrarian human potential require further scientific research.

SOURCES OF DATA AND METHODS USED

The research methodology is based on the monographic study and interpretation of previously obtained results, reflecting trends, prospects and specifics of human capital development in the agrarian sector. The subject area of research predetermined the choice of methods and tools based on the inductivity of research approaches, quantitative analysis and qualitative synthesis of input information. In order to increase the reliability of the obtained results, in the process of research we used such methods as review, continuity of observation, analysis of the stability of input data, monitoring of the close interaction of statistical indicators, and the selection of contradictory data. The methodology of collecting the input materials for the study is based on the use of official documents, collections, bulletins of the National Statistical Committee of the Republic of Belarus.

RESEARCH FINDINGS AND DISCUSSION

The priorities of the global economy indicate the limited impact of resource advantages. It determines the dominant role of innovation and technological factors, which include the level of accumulated human capital. Given the low resource intensity of the domestic economy, the analysis of methodological approaches to assessing the functioning and development of human capital seems particularly relevant.

One of the advantages of human capital is its inexhaustibility, which is due to the quantity and quality of its representatives. Human society, in its narrowest sense, is an integrated set of people. The level of its development is conditioned by the abilities of individuals. The interaction of the latter factors ensures the accumulation of individual potential and its collective increment. This circumstance characterizes the multiplicity of human capital as the ability of its expanded generation. The unique ability of self-reproduction distinguishes this form of capital from other forms of capital. The available material and technical opportunities, socio-economic conditions and institutional environment contribute to the intensity of accumulation and increment of human capital. Its source is concentrated in the human being himself. This generates the circular reproduction of human capital on a simple or extended basis. The study, adaptation and development of methodological approaches to measure the effectiveness of human capital functioning in the agrarian sector are conditioned by the objective necessity of branch development, as well as by the specific features of the research object.

Industrial and institutional transformations penetrating into all spheres of society also affect the agricultural sector, which contributes to the emergence of a new form of human capital – the agrarian. Its distinctive feature is the spatial and sectoral projection of the formation of initial human potential transformed, taking into account demographic characteristics of the local population, educational level of employees, state of the social infrastructure of rural areas, parameters of the production potential of agricultural sector organizations, investment security and innovation saturation of the agro-industrial complex, into agrarian human capital. Specialization and integration of agro-industrial production, which is a consequence of technological changes, act as a reason for increasing the knowledge-intensive capitalization of assets accumulated in human resources. Intellectual reproduction of the latter contributes to the formation of the surplus product, the value of which is more filled with knowledge (intellectual product) than with physical labor (material capital).

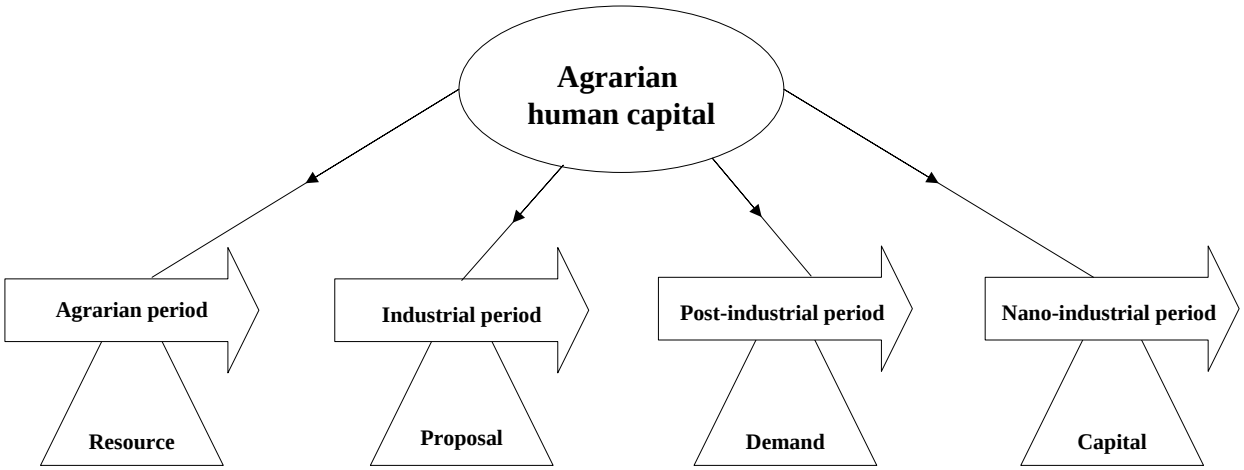
The concept of agrarian human capital goes beyond the territorial-quantitative assessment of population and is projected into the plane of agro-industrial production. In the context of the above, agrarian human capital is understood as a quantitative and qualitative measure of the creation of

surplus value of agrarian production, formed under the influence of a certain socio-economic formation, characterized by a constant movement and increment, providing the creation of an innovative product in material and non-material embodiment (Гануш, Тетеринец, 2022).

Peculiarities of the formation and development of agrarian human capital actualize the task of improving methods of management of this process. Socio-economic, technical-technological and institutional transformations in the agricultural sector contribute to the emergence of scientific schools, which determine the theoretical directions and methodological approaches of management. Aggregation of the conducted studies and their refraction in the plane of agroindustrial production allow us to identify the main stages of transformation of conceptual aspects of human capital management depending on the stages of socio-economic and technical-technological development of the agrarian sector (figure 1).

Figure 1:

Transformation of the nature of agrarian human capital at different stages of industrial development.



Source: compiled based on (Зикунова, 2016).

Conceptual approaches to the management of human capital development form theoretical postulates and modifications of the categorical apparatus. Further, there is a transformation of methodological approaches to assess the effectiveness of its functioning. In the theory and practice of economic analysis there is a sufficient number of methodologies that contribute to such research. Sector specifics of the object of the research, peculiarity of conditions of formation and development, and non-triviality of capitalization mechanisms predetermine the need to develop new approaches to measure the effectiveness of agrarian human capital functioning, which will comprehensively take into account the relationship of the above-mentioned factors.

The objective condition for solving this problem is to determine the quantitative value of agrarian human capital from the position of its functional refraction. The latter circumstance is the resulting factor of the transformation of human potential into capital and is determined by the amount of income received from its use. In this context, the use of the expenditure method is inexpedient, which is caused by a rather tentative ability of the current investment costs to reflect the possibilities of capitalization of human potential. There is no denying the importance and necessity of such investments; however, it is initially somewhat premature to accept them as a positive result. In particular, as studies have shown, the level of literacy of the population weakly correlates with the

ability to capitalize on the knowledge gained (Попов, 2020). In other words, the number of schools, colleges and universities, acting as one of the main elements of investment spending and forming the basis of human potential, all other things being equal, is not an indication that the knowledge received in them will be transformed into capital.

As a result, we can conclude that the income method of cost estimation of human capital is the most effective from the position of measuring the efficiency of functioning. This method is also not without some disadvantages. Its main advantage is the possibility to determine the total value, which shows the level of capitalization of human potential. The author's understanding of human capital is to consider not only the total of accumulated knowledge, skills, qualifications, health and other factors, but also the value added, which can be transformed into financial and non-financial wealth.

Despite the high importance of the latter factor, its quantitative assessment is challenging because of the high differentiation of approaches revealing its essence. As a consequence, statistical analysis becomes virtually impossible, which is complicated by the peculiarities of the territorial and sectoral approach. In these circumstances, the most practice-oriented solution is the assessment of human capital in the agricultural sector through the prism of received incomes.

Current research in this area encounters a number of problems of statistical analysis of data due to the intersection of sectoral and territorial planes:

- *the spatial and sectoral projection of agrarian human capital is disclosed in the context of rural areas, accumulating an integrated set of human resources and the focus of agrarian activities;*
- *aggregation of sources of income of the rural population for the purpose of an integrated assessment of agrarian human capital. It is proposed to use the value of disposable resources as a generalizing initial indicator, which includes not only money, but also the value of consumed food products produced in private subsidiary plots, excluding material costs of their production, as well as the value of benefits and payments received in kind, which is most typical of rural areas (Тетеринец, 2021).*

The proposed approach to the assessment of agrarian human capital has a theoretical and methodological research base and is based on official statistical data. It should be noted that the number of rural residents is identical to the number of household members, making the agrarian human capital assessment comparable (table 1).

Table 1.

Indicators of agrarian human capital

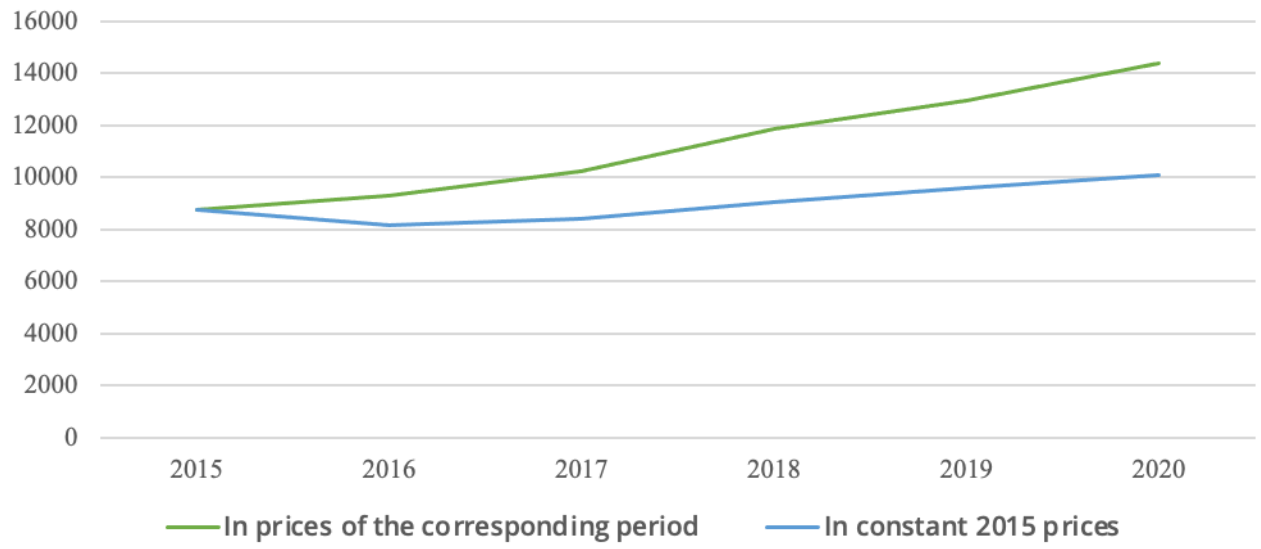
Indicators	Period					
	2015	2016	2017	2018	2019	2020
Disposable resources of households in rural areas, rubles per month	724,7	773	855,1	995,8	1089,5	1207,7
Number of households in rural areas	1009184	1004002	998847	993718	992742	992742
Calculated value of agrarian human capital in current prices, million rubles	8776,3	9313,1	10249,4	11874,5	12979,1	14387,2
Calculated value of the agrarian human capital in constant prices of 2015, million rubles	8776,3	8170,7	8398,9	9065,9	9618,8	10075,2

Note: *compiled by the author (Тетеринец, 2021; Социальное положение, 2021; Число и состав домашних хозяйств, 2020).*

The calculated value of human capital in the agricultural sector of the Belarusian economy is 14387.2 million rubles and increased almost 1.6 times during the period under study. The trend of its change is due to two interrelated but multidirectional vectors: a significant increase in the disposable resources of households in rural settlements with a simultaneous decline in the rural population (figure 2).

Figure 2.

Dynamics of the estimated value of human capital in the agricultural sector, million rubles.



Source: own calculations.

The elimination of inflationary fluctuations allows us to obtain a comparable estimate of the value of the agrarian human capital. Using the index of changes in real disposable income in prices of 2015 allows us to obtain its value in constant prices. The calculations show that in the period under study, the comparable value of the agrarian human capital increased by 1.2 times, which reflects its qualitative growth. Determination of the quantitative value of human capital forms a methodological platform for measuring its functioning efficiency. The comparison of the obtained assessment with other macro- and meso-indicators allows studying the dynamics of its quantitative changes, identifying qualitative shifts, and determining perspective directions of development.

Taking the need for a qualitative assessment of the efficiency of agricultural human capital functioning as a basis, it is advisable to use the methodology of its calculation, based on the comparison of qualitative indicators. The latter allows determining the ratio of the results obtained at a certain point in time, determined by the initial value of the evaluated parameter. In the context of the above, it is proposed to use the following system of indicators, comprehensively reflecting the relationship between changes in qualitative macro-criteria and the size of agrarian human capital:

- *human capital efficiency coefficient ($\overline{EHC_t}$), which is calculated as the ratio of gross value added of agriculture to the value of agricultural human capital. This allows us to determine the real return on its use, which is expressed by the amount of newly created value.*
- *the coefficient of prolonged efficiency of human capital ($\overline{\Delta EHC_{t-n}}$), which is calculated as the ratio of the growth of gross value added of agriculture to the value of agricultural human capital. This indicator is an additional indicator and reflects the real contribution of human capital, taking into account the time lag. As the latter, it is proposed to use a four-year interval as a period reflecting the successive increase in human capital, taking into account the time spent on higher education.*

- *productivity of human capital ($\overline{PHC_t}$), distinguished by the use in the denominator of the value of agrarian human capital as a qualitative parameter, reflecting the efficiency of its functioning in the context of the current socio-economic transformations.*
- *productivity elasticity coefficient ($\overline{I_{L/P}}$), which is determined by the correlation between the growth rate of labor productivity and productivity of agrarian human capital. This aggregate index reflects the correlation of the quantitative parameter of the rural population and the qualitative indicator that contributes to the growth of human capital.*
- *profitability elasticity coefficient ($\overline{I_{Pr/HC}}$). It characterizes the relationship between the rate of change in the profitability of the agricultural sector and the capitalization of human capital. This indicator is defined as the ratio of the growth rate of net profit of agricultural organizations and the value of the agrarian human capital.*

The income level of the rural population is equivalent to the value of human capital and reflects its estimated value at a particular point in time. It is predetermined by the abilities of self-realization of an individual and the socio-economic conditions that ensure its realization. A variety of objective and subjective factors directly impact this process, contributing to the increase or decrease in the level of capitalization.

The intensity of human capital accumulation becomes possible through a proportional increase in qualitative macro-metrics. The opposite situation is evidence of the predominant influence of extensive factors. The presented methodology is based on the transformation of the income approach of determining the quantitative value of agrarian human capital into the plane of evaluation criteria, characterizing the efficiency of human capital functioning. In the context of the modern theory of human capital development management, such an approach can be called an acmeological approach, which takes into account the impact of not only quantitative indicators, but also qualitative parameters [Edvinsson]. The proposed system of acme-indicators allows us to comprehensively assess this relationship through the prism of the effectiveness of its functioning (table 2).

Table 2.

Acme-indicators for assessing the effectiveness of the functioning of the agrarian human capital

Indicators	Period					
	2015	2016	2017	2018	2019	2020
Human capital efficiency coefficient ()	0,64	0,70	0,78	0,68	0,71	0,70
The coefficient of prolonged efficiency of human capital ()	–	–	0,206	0,203	0,201	0,142
Productivity of human capital (), руб/руб	1,54	1,66	1,76	1,59	1,59	1,58
Productivity elasticity coefficient ()	–	0,99	1,03	1,10	1,08	1,11
Profitability elasticity coefficient ()	–	-46,71	2,51	0,65	1,58	0,83

Note: *calculated based on (Сельское хозяйство, 2021).*

The assessment of the obtained data allows us to note the increase in the effectiveness of the functioning of the agrarian human capital in the medium term, while there is an outlined dynamics of its decrease in the tactical plan. The combined analysis of the acme-indicators and shows a significant decrease in the return of agrarian human capital, taking into account its intellectual contribution. The steady decline in the coefficient of prolonged efficiency characterizes the decrease in the growth of added value in agriculture per ruble of

capitalized human capital. Therefore, we can conclude that the educational component of agrarian human capital, as well as investment expenditures for this purpose, do not provide the proper effect.

The coefficient of productivity elasticity reflects the level of intensity of development of the agrarian sector. It is demonstrated through the interaction of human and labor capitals. This index represents the percentage change in labor productivity, taking into account the change in 1 % of agrarian human capital productivity growth. Calculations show its steady growth, characterizing the direct dependence of quantitative output parameters on qualitative indicators of innovative saturation of human capital. The dynamics of changes in the productivity of human capital have a reverse vector, thereby revealing a decrease in its efficiency. The combination of the existing trends allows us to state the following: the extensive nature of its accumulation occurs faster than the return on its use.

CONCLUSIONS

The innovative vector of socio-economic development of society determines the relevance of concentration in the agricultural sphere of the intellectual component. This represents the degree of influence of human capital on the formation of the final results of agricultural organizations. This necessitates the study of the impact of the relationship of the evaluated parameters by correlating the rate of their change in the dynamics. Such indicator is the coefficient of profitability elasticity.

The calculations show that there is no direct correlation between the profitability of organizations and the amount of accumulated agrarian human capital. To a certain extent, this characterizes the inefficiency of the latter, as it contradicts the previously conducted theoretical and empirical studies. The human being in the modern world is one of the main drivers of economic growth, forming the reserve for its progressive development. Underutilization of human potential significantly limits the opportunities of the agrarian sector for sustainable reproduction and actualizes the task of priority use of this reserve.

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ALTERNATIVE SOURCES OF ENTERPRISE FINANCING AND THE IMPACT OF COVID-19 PANDEMIC

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ABSTRACT

In current conditions of digital transformation and difficulties in accessing traditional financing, alternative sources of finance acquire particular importance. At the same time, the knowledge regarding the alternative finance market is yet in its infancy, with little evidence of the effects of the Covid-19 pandemic on the alternative finance market in Moldova. Therefore, the article aims to explore financing alternatives for enterprises in Moldova and determine the effects of the Covid-19 pandemic on the alternative finance market. Additionally, there were analysed data from other reference countries. In order to achieve the objective of the study, a mixed research approach, based on both primary and secondary data, was used: analysis of statistical data, international rankings, comparison, synthesis, deduction, as well as a questionnaire-based survey designed for small and medium-sized enterprises. SMEs have proven to be vulnerable to crises. The alternative finance market in Moldova was analysed, showing that despite a rise in recent years, alternative sources of financing are still poorly developed. The study shows that enterprises face the biggest problems in accessing venture capital, financing on the securities market and use of electronic platforms to attract funding (crowdfunding, cryptocurrencies, etc.). At the same time, there was registered an improvement in accessing crowdfunding since the beginning of the pandemic. Generally, obtained results are essential for further research, practitioners and in determining measures to facilitate access to finance.

Keywords: *alternative finance, crowdfunding, entrepreneurship, finance, Fintech, peer to peer lending, venture capital.*

În condițiile actuale de transformare digitală și dificultăți în accesarea finanțării tradiționale, sursele alternative de finanțare capătă o importanță deosebită. În același timp, cunoștințele privind piața de finanțare alternativă sunt încă scăzute. De asemenea, nu există suficiente informații despre efectele pandemiei Covid-19 asupra pieței de finanțare alternativă din Moldova. În acest context, articolul își propune să exploreze surse alternative de finanțare pentru întreprinderile din Moldova și să determine efectele pandemiei Covid-19 asupra pieței de finanțare alternativă. În plus, au fost analizate și date din alte țări de referință. Pentru atingerea obiectivului studiului a fost utilizată o abordare mixtă de cercetare, bazată atât pe date primare, cât și pe cele secundare: analiza datelor statistice, clasamente internaționale, comparație, sinteză, deducere, precum și chestionarul pentru întreprinderile mici și mijlocii. IMM-urile s-au dovedit a fi vulnerabile la crize. A fost analizată piața de finanțare alternativă din Moldova, care a arătat că, în ciuda unei creșteri în ultimii ani, sursele alternative de finanțare sunt încă slab dezvoltate. Studiul arată că întreprinderile se confruntă cu cele mai mari probleme în accesarea capitalului de risc, finanțarea pe piața valorilor mobiliare și utilizarea platformelor electronice pentru a atrage finanțare (crowdfunding, criptomonede etc.). Totodată, de la începutul pandemiei s-a înregistrat o îmbunătățire a accesului la crowdfunding. În general, rezultatele obținute sunt importante pentru cercetările ulterioare, practicieni și elaborarea măsurilor de facilitare a accesului la finanțare.

Cuvinte cheie: *finanțare alternativă, crowdfunding, antreprenoriat, finanțe, fintech, creditare peer to peer, capital de risc.*

В современных условиях цифровой трансформации и сложности доступа к традиционному финансированию особое значение приобретают альтернативные источники финансирования. В то же время знания о рынке альтернативных финансов все еще находятся на начальной стадии, кроме того, недостаточно исследовано влияние пандемии Covid-19 на рынок альтернативных финансов в Республике Молдова. Таким образом, цель статьи состоит в исследовании альтернативных источников финансирования предприятий в Республике Молдова и определении

влияния пандемии Covid-19 на рынок альтернативных финансов. Кроме того, были проанализированы данные из других стран. Для достижения цели исследования был использован смешанный исследовательский подход, основанный как на первичных, так и на вторичных данных: анализ статистических данных, международных рейтингов, сравнение, синтез, дедукция, а также анкетный опрос малых и средних предприятий. МСП оказались уязвимыми перед кризисами. Был проанализирован рынок альтернативного финансирования в Республике Молдова, который показал, что, несмотря на рост в последние годы, альтернативные источники финансирования все еще слабо развиты. Исследование показывает, что наибольшие проблемы у предприятий возникают при доступе к венчурному капиталу, финансированию на рынке ценных бумаг и использовании электронных площадок для привлечения финансирования (краудфандинг, криптовалюты и др.). В то же время было отмечено улучшение доступа к краудфандингу с начала пандемии. В целом, полученные результаты важны для дальнейших исследований, практиков и при определении мер по облегчению доступа к финансам.

Ключевые слова: *альтернативные финансы, краудфандинг, предпринимательство, финансы, финтех, пиринговое кредитование, венчурный капитал.*

JEL Classification: *G20, G30, O16, L26*
UDC: *336.648*

INTRODUCTION

Small businesses represent a key part of most economies, contributing to employment and sustainable economic development. Despite their significant role, Small and Medium-sized Enterprises (SMEs) still face a number of challenges, one of the most significant being access to financing, which affects the productivity and growth of enterprises. This is especially relevant when considering the global pandemic. The Covid-19 pandemic has affected the normal economic order, causing a major economic shock. Specifically, SMEs were seriously hit due to their disadvantaged position during the crisis (Brown et al., 2020; Doshi et al., 2018). Along with all the negative effects, the COVID-19 pandemic has accelerated the trend towards digitalisation (Klein & Todesco, 2021), including digital transformation in the financial sector (Fu & Mishra, 2022).

The rise of alternative financial channels represents a significant outcome of the digitalisation of the entrepreneurial finance ecosystem (Bertoni et al., 2021). Alternative financing instruments are valuable sources of external funding of SMEs' activity, especially when they experience borrowing constraints from banks. At the same time, alternative finance instruments remain poorly developed in Moldova. Therefore, difficulties in accessing finance are significant challenges for SMEs, which are becoming very pronounced due to the current crisis, proving the relevance of the research topic.

The paper aims to explore financing alternatives for enterprises in Moldova and determine the effects of the Covid-19 pandemic on the alternative finance market.

This study contributes to the growing literature on alternative finance markets in developing countries on example of the Republic of Moldova, and the effects of the COVID-19 pandemic on entrepreneurial finance.

The remainder of the paper is organised as follows. Section 2 presents a literature review, followed by a methodology section, describing the data sources and research methods. Section 4 explores the level of development of alternative finance in Moldova and analyses the effects of the Covid-19 pandemic on alternative finance of small businesses. The last section reveals the main conclusions of the study.

LITERATURE REVIEW

SMEs are the leading form of enterprise globally. They account for approximately 99% of all enterprises in Moldova and employ 60,1% of the population. The access to finance is essential for the activity, growth and innovation of SMEs. Despite their importance, SMEs are perceived by banks as high-risk clients with limited collateral options (Corredera-Catalán et al., 2021), higher degree of informality, lack of history and lower financial management capacities (OECD et al., 2020, Berger & Udell, 2006). Thus, SMEs are unlikely to have the required amount or type of assets to act as loan guarantees. They may not have a long-standing relationship with a financial institution. The high cost and slow financing of SMEs is a great challenge for economic development, which has aroused the concerns of many scholars (Song et al., 2020). In this context, alternative sources of finance acquire special attention.

Several studies have focused their attention on the analysis of access to finance in developing countries (Ayyagari et al., 2021; Nizaeva & Coskun, 2019; Manzoor et al., 2021) and alternative sources of finance during the pandemic (Sahay et al., 2020; Fu & Mishra, 2022; Liu et al., 2022). For several years technology was changing the landscape of the financial sector, increasing access to financial services (Sahay et al., 2020). During the pandemic, there were created new opportunities for digital financial services. Alternative sources of finance include peer-to-peer lending, equity finance, angel investments, crowdfunding, etc. They are disrupting traditional financial markets and offer new opportunities for business.

Traditional financial services require high investments in branches and staff, while online financial services have limited operational costs with minimum staff and no branches. As L. Lu (2018) noted, technologies have provided alternative lenders a "competitive advantage in terms of saving costs and improving business efficiency". Due to the use of big data technology and artificial intelligence, online lending platforms have access to more information about the borrowers and can faster and more precisely evaluate the credit risk. Additionally, in contrast with banks, online sources of finance have no geographical limitations.

Thus, digital financial services are disrupting traditional financial markets and offer new business opportunities. They are generally perceived as being faster, more efficient, and typically cheaper than traditional financial services (Sahay et al., 2020). Compared to traditional financial instruments, Fintech is more inclusive, offering additional opportunities for overcoming the financial constraints of SMEs (Gao, 2022).

The online alternative finance market is still small, but growing fast from 1.5 billion USD in 2013 to 23.2 billion USD in 2019. At the same time, the knowledge regarding alternative finance markets is yet in its infancy. Additionally, to our knowledge, the effects of pandemic were not explored on alternative finance market in Moldova.

METHODOLOGY

The research is based on a mixed approach, using both primary and secondary sources of data. The study draws upon primary data collected using a questionnaire-based survey. The questionnaire provides data on the impact of alternative sources of finance on the development of entrepreneurship in Moldova and their changes over the past two years. The questionnaire was designed for small and medium-sized enterprises. The total number of respondents amounted to 106 entrepreneurs from micro, small and medium-sized enterprises from different regions according to their distribution in the North, Centre and South of Moldova. The questionnaire consisted of two parts. First, the impact of different indicators of the development of entrepreneurship was identified. Secondly, the trend of these indicators over two years (2021 compared to 2019) was determined.

Additionally, the following scientific methods were used: analysis of statistical data, international rankings, comparison, synthesis, and deduction.
The data for performing the analysis were extracted from databases of the National Bureau of Statistics, World Bank, Cambridge Centre for Alternative Finance, World Economic Forum, and Organisation for Economic Co-operation and Development.

The limitations of chosen research methods lie in questionnaire data obtained from respondents from one country. For future research, it would be interesting to evaluate the perceptions of entrepreneurs from other reference countries.

Covid-19 and the alternative finance market in Moldova

The main sources of financing the investment activity of enterprises in Moldova are their own means reaching 65% of total investments in long-term tangible assets in 2016. However, insufficient financial resources determine enterprises to access external sources to finance their activity.

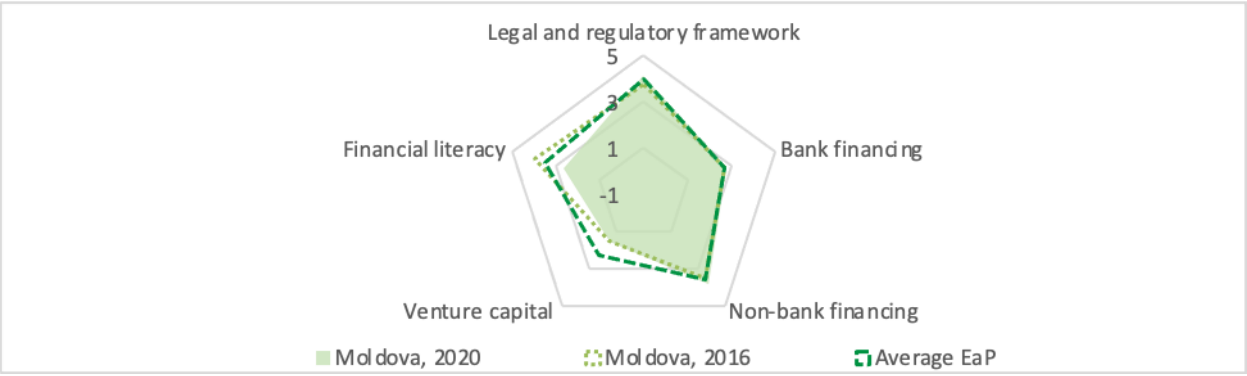
Over 80% of the total credit supply is covered by bank financial resources (NCFM, 2020). In the last five years, the share of loans in GDP granted by non-bank credit organisations (NCOs) has increased 1,6 times, constituting 4.66% in 2020. In the structure of the lending sector, their share constituted 14.5% in 2020, or by 1.8 p.p. more than in 2017. The share of loans in GDP granted by Savings and credit associations did not change considerably in the last years, accounting for 0.46% in 2020. Non-bank credit organisations and Savings and credit associations are slowly growing as sources of financing for SMEs, especially in rural areas, mainly due to the high requirements of bank guarantees. At the same time, it should be noted that 82% of NCOs loans are granted to individuals and only 18% are offered to legal entities. Other sources of financing such as leasing, business angels, crowdfunding, and venture capital are still poorly developed.

In order to highlight the strengths and weaknesses of policies that support access to finance for SMEs, there were analysed data from SME Policy Index (OECD et al., 2020). The country ranks third out of the Eastern Partnership (EaP) countries on pillar – *Access to finance*, with a score of 3.61 (out of max. 5), slightly exceeding the average of EaP countries (3.57) and is 0.21 more than in the previous report in 2016. Georgia and Armenia rank higher: 4.02 and 3.81, correspondingly.

The Republic of Moldova obtained better scores on the sub-dimensions: *Legal and regulatory framework* (4.1) and *Non-bank financing* (3.79), exceeding the average of EaP countries by 0.11 and 0.24 respectively (figure 1).

Figure 1.

Score of the sub-dimensions of the pillar Access to financing in Moldova

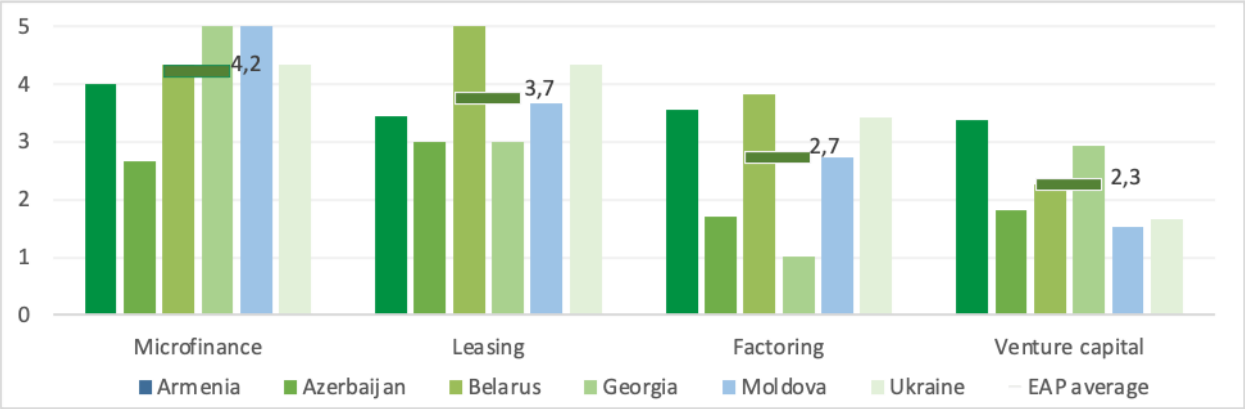


Source: *developed by the author based on SMEs Policy Index 2020*

At the same time, the *Stock market* (score of 2.43) does not represent a potential source of business financing. The country obtained the lowest scores in the *Venture Capital* (1.53) and *Financial Literacy* (2.67) sub-dimensions, being lower by 0.73 and 0.79, respectively, compared to the average of EaP countries.
Analysis of non-bank sources of finance (figure 2) showed that Moldova obtained the highest score on Microfinance (5.0). Adoption of Law no. 1 on non-bank credit organisations from 16.03.2018 was an important step in diversifying the sources of financing, including strengthening leasing regulations, but alternative sources of finance remain underutilised in the country. The share of leasing in the structure of the credit sector in the country has decreased by 1.2 p.p. from 3.8% in 2017 to 2.6% in 2020 (NCFM, 2022). In the field of factoring, there is a corresponding regulation, which could be further improved. At the same time, no statistics are available to assess the market penetration of this instrument.

Figure 2.

Scores for the non-bank financing indicators in EaP countries



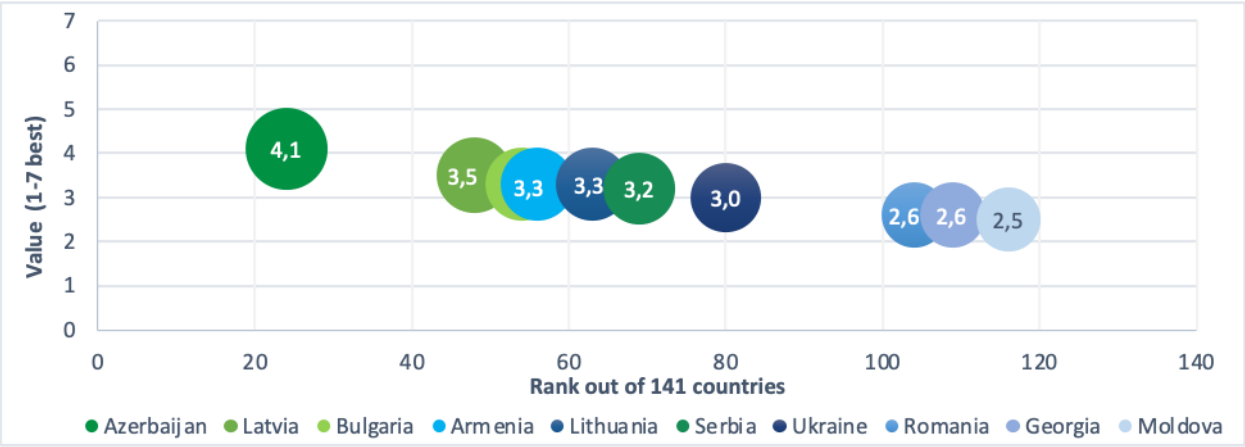
Source: *developed by the author based on SMEs Policy Index 2020*

In relation to other EaP countries, Moldova ranks last on the *Venture Capital* sub-dimension (1.53), the highest score being obtained by Armenia (3.37). In Moldova, plans to introduce a legal framework for venture capital have existed for years, but it has not been adopted yet. Generally, this financial instrument is underutilised in the country.

Thus, in terms of ease for start-up entrepreneurs with innovative but risky projects to obtain equity funding, Moldova is placed last compared to reference countries, ranking 116 out of 141 countries with a value of only 2,5 (figure 3).

Figure 3.

Venture capital availability in the Ranking of Moldova and reference countries



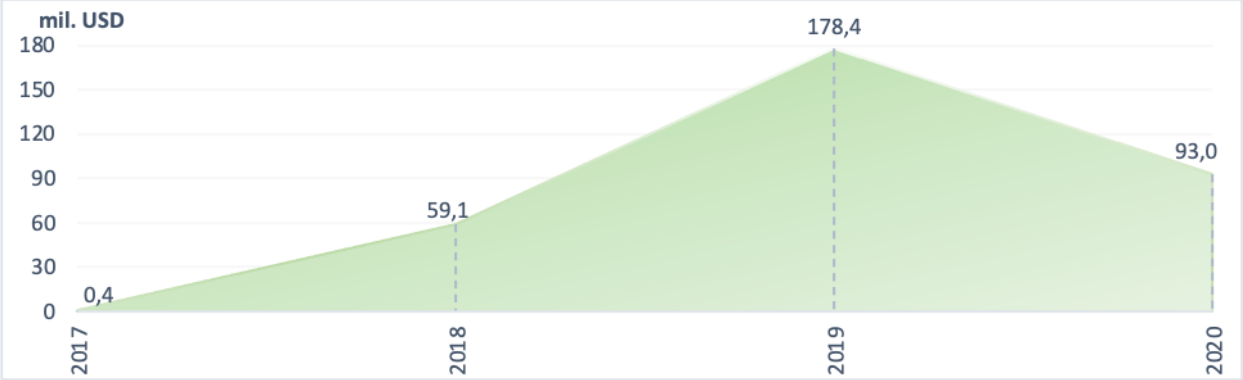
Source: *developed by the author based on Global Competitiveness Report (Schwab, 2019)*

Another alternative source of finance is crowdfunding. Crowdfunding represents an emerging type of equity-based, non-bank financial instrument. There are various types of crowdfunding, specifically: peer-to-peer, equity and rewards-based, donation-based, profit-sharing, and debt-securities crowdfunding. In order to analyse the development of this financial instrument, there was analysed data on business volumes of crowdfunding platforms through annual surveys provided by the Cambridge Centre for Alternative Finance (CCAF). They represent data for this alternative finance in the form of digital lending (balance sheet lending, peer-to-peer lending, debt-based securities, invoice trading) and digital capital raising (investment and noninvestment-based crowdfunding).

Crowdfunding is still a small market, but it is growing fast. Many companies experienced difficulties during the Covid-19 pandemic. Over the years, the European (including the UK) online alternative finance market volume grew consistently from 1.5 billion USD in 2013 to 23.2 billion USD in 2019. However, 2020 saw a drop in overall market volume to 22.6 billion USD, representing the first decrease in market volume since 2013. At the same time, it is important to remark that the crowdfunding industry provided additional support and flexibility for businesses. Out of the total amount, crowdfunding platforms in Europe, excluding the UK, raised 5.2 billion USD for businesses in 2020 or by 0.9 billion USD more than in the previous year. Volumes for SME focused finance have been increasing steadily over recent years, with business funding accounting for 35% of the total volume in 2019 and 52% in 2020 (CCAF, 2022).
Data for Moldova show that the crowdfunding market was also increasing in Moldova, reaching 178.4 million USD in 2019 (figure 4). But the amount dramatically decreased by 47.9% in 2020 due to uncertainty on the market, conditioned by the Covid-19 pandemic.

Figure 4.

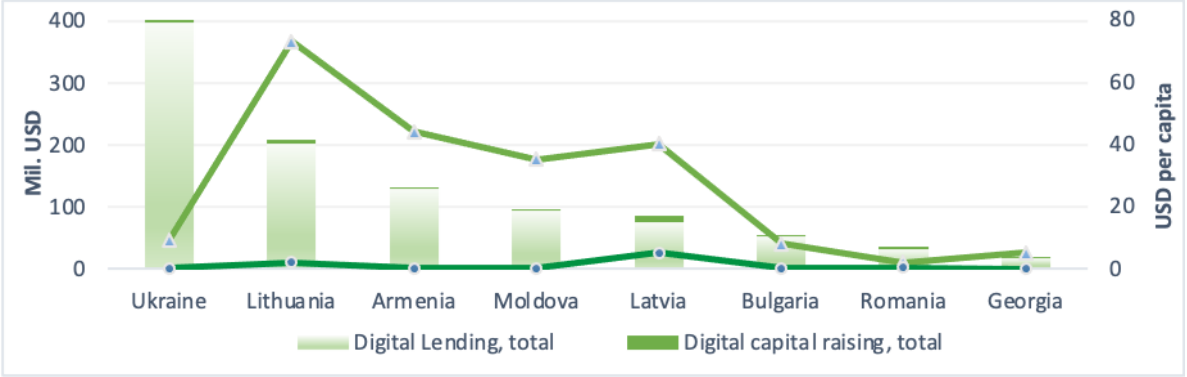
Online alternative finance market in Moldova for 2017-2020



Source: *developed based on Ziegler et al. (2021), CCAF (2022)*

Comparative data on online alternative finance market in Moldova and reference countries is represented in figure 5.

Figure 5. ***Online alternative finance market in Moldova and reference countries, 2020***



Source: *developed based on Ziegler et al. (2021), CCAF (2022)*

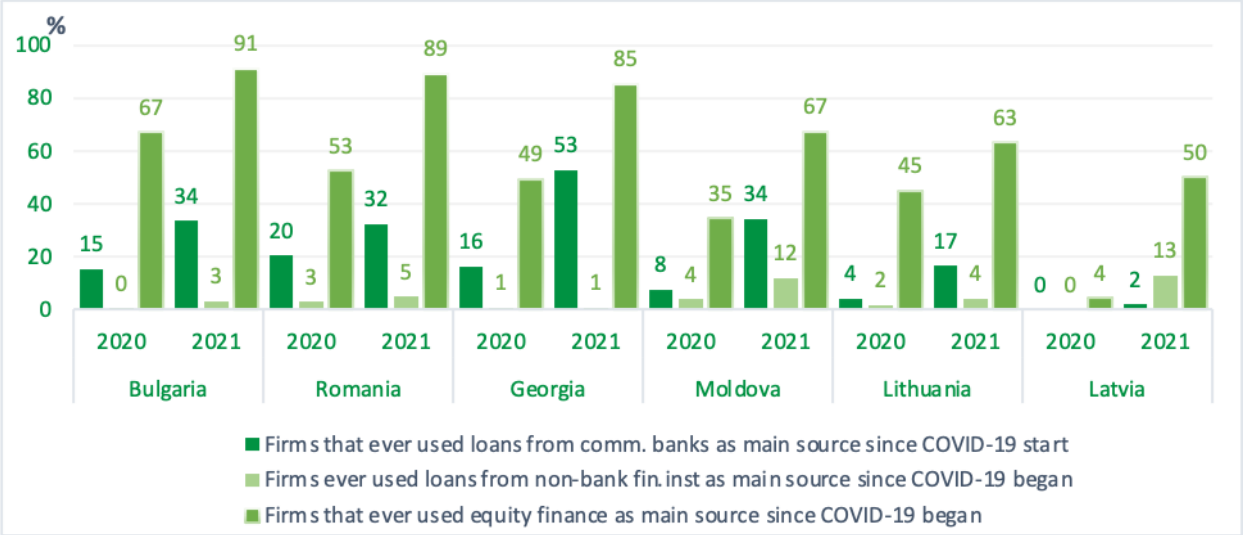
Although, there was registered a significant decrease in the crowdfunding market, Moldova is in fourth place in terms of online alternative finance per capita among reference countries, following Lithuania, Armenia and Latvia.

According to World Bank Enterprise Survey 2019, 29.4% of the respondent enterprises in Moldova identify access to financial resources as a major constraint, twice the average in Europe and Central Asia (14.7%). Due to the COVID-19 pandemic, the private sector experienced growing financial distress. Totally 96.5% of firms in the republic ever experienced decreased liquidity or cash flow availability since COVID-19 began, the indicator being worse compared to other reference countries (Georgia – 84.0%, Bulgaria- 81.0%, Lithuania -78.9%, Romania – 65.7%, Latvia – 59.0%). These led to delay payments to suppliers, reported by 69.3% of firms.

At the same time, the Covid-19 pandemic accelerated the digitalisation processes in all spheres of activity. According to WB Enterprise Survey (2022) data, the percent of firms that started or increased online business activity constituted 32% in June 2020 and doubled in June 2021 (68%). In terms of sources of finance, it could be observed that bank loans prevail over non-bank loans in most of the analysed countries (figure 6).

Figure 6.

Percentage of firms that used bank and non-bank sources of finance since Covid-19 began



Source: *developed by the author based on World Bank Enterprise Surveys follow-up on Covid-19*

Nevertheless, as of June 2021, over half of respondents mentioned that their loan application was rejected, 34% of Moldovan firms reported the use of bank loans as the main source since Covid-19 began and 12% - the use of loans from non-bank financial institutions. At the same time, a big share of firms reported that they used equity finance as the main source of finance (67%).

QUESTIONNAIRE DATA:

Respondents' evaluation of the alternative sources of finance

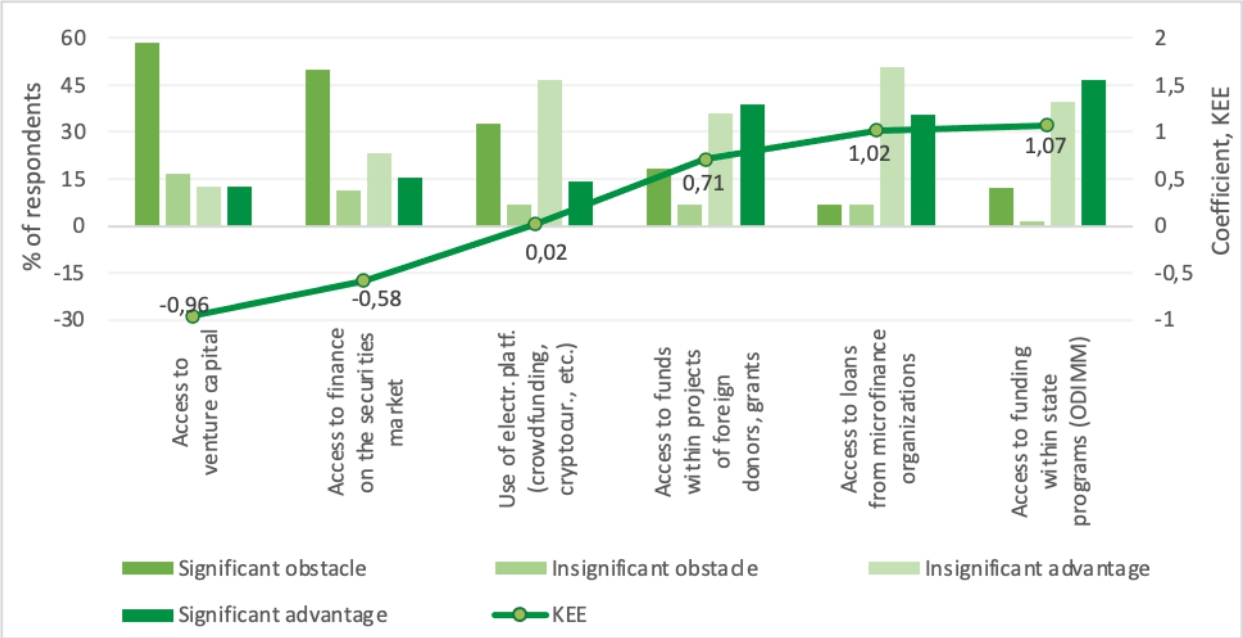
Based on the conducted survey, the access to alternative sources of finance and their impact on the development of entrepreneurship and the entrepreneurial ecosystem were considered. An important indicator is the coefficient of evaluation of the entrepreneurial ecosystem (K_{EE}), which shows the weighted average evaluation of the entrepreneurial ecosystem by a specific indicator. The value of the coefficient varies between "-2" - meaning that the analysed indicator represents a significant obstacle to the development of the entrepreneurial ecosystem, to "+2" - meaning that the analysed indicator

represents a substantial advantage for the development of the entrepreneurial ecosystem, zero value means a neutral impact.

Analysis of the alternative sources of finance in Moldova shows that enterprises encounter the biggest challenges in accessing venture capital (K_{EE} = -0.96) and financing in the securities market (K_{EE} = -0.58) (figure 7). The access to venture capital was assessed negatively by 75% of entrepreneurs who evaluated the given indicator, and the access to finance on the securities market - by 62%, which reflects a relatively poor degree of development of these financing instruments in the country. Over half of the respondents consider that these indicators significantly hinder entrepreneurship development (58.3% and 50.0%, respectively).

Figure 7.

Evaluation of the SMEs access to alternative sources of finance, % of respondents who evaluated the indicators



Source: *developed by the author based on the questionnaire data*

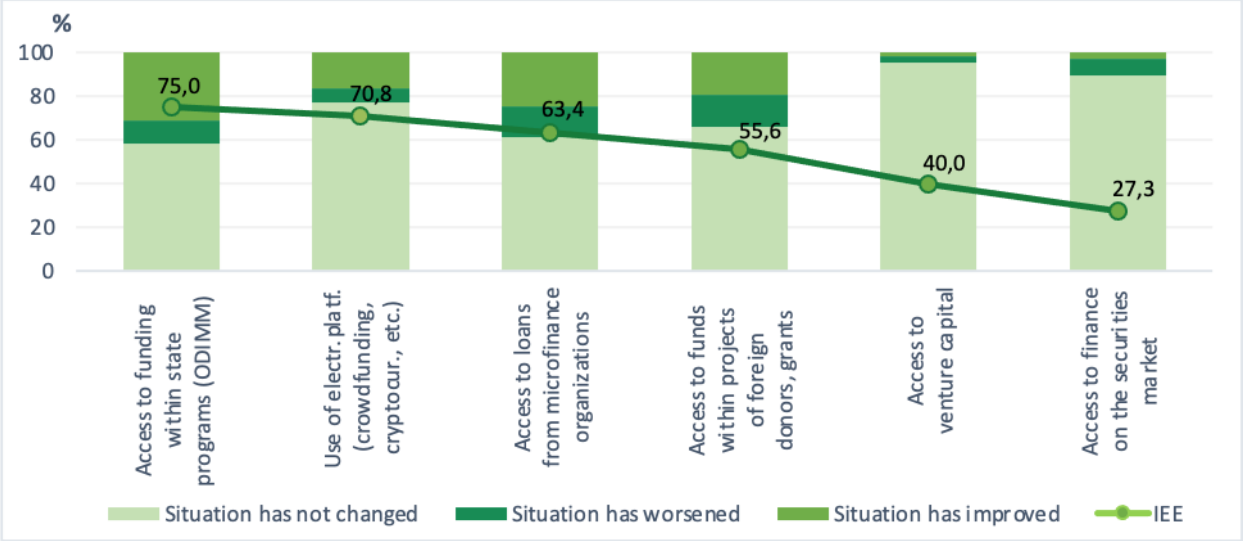
Nevertheless, the use of electronic platforms to attract funding (crowdfunding, cryptocurrencies, etc.) has an almost neutral impact, K_{EE} = +0.02, many entrepreneurs indicated that they face difficulties in accessing them (obstacle for 39.5% of respondents who assessed this indicator). Access to funding within the projects of foreign donors, including international organisations, and grants (K_{EE} = +0.71) was positively evaluated by over 70% of respondents. At the same time, for 1/4 of entrepreneurs, this represents a problem. The other two indicators, referring to the access to financing within the state programs implemented by ODIMM (K_{EE} = +1,07) and the access to loans from the microfinance organisations (K_{EE} = +1,02), are perceived by entrepreneurs as a potential advantage for their enterprise.

Additionally, it should be mentioned that the evaluation of the access to finance by size of enterprise reveals that respondents from small enterprises perceive access to finance as a problem for business and entrepreneurial ecosystem development (33%) relatively more frequent compared to respondents from medium enterprises (16%). Also, it was determined that access to finance is a bigger problem for enterprises in the industrial (41%) sector, construction (39%) and services (34%).

According to the survey data, the majority of respondents consider that the situation regarding access to finance by enterprises has not changed since 2019 (figure 8).

Figure 8.

Changes in access to alternative sources of finance registered in 2021 compared to 2019, % of respondents



Source: *developed by the author based on the questionnaire data*

The highest values of the Change Perception Index of Entrepreneurial Ecosystem (I_{EE}), which reflects the greatest relative excess of positive evaluations regarding the changes in access to finance within the entrepreneurial ecosystem, are registered in the indicators "Access to funding within state programs, implemented by ODIMM" (I_{EE} =75.0%) and "Use of electronic platforms to attract funding (crowdfunding, cryptocurrencies, etc.)" (I_{EE} = 70.8%).

Besides access to funding within state programs, the indicators "Access to loans from microfinance organisations" and "Access to funding within projects of foreign donors, including international organisations, grants" show the highest share of respondents who indicated a change in the situation: 25% and 19% of respondents indicated an improvement and 14% and 15% - worsening of the situation respectively. "Access to finance on the securities market" is the indicator with the lowest value of the I_{EE} index (27.3%), which reflects the largest relative excess of negative assessments associated with changes in the entrepreneurial ecosystem. Another indicator that reveals the situation's relative deterioration is "Access to venture capital" (I_{EE} = 40.0%).

CONCLUSIONS

The capacity of enterprises to access financial resources remains one of the main challenges affecting their activity, especially during the current crisis caused by the Covid-19 pandemic. Along with all the negative effects, the COVID-19 pandemic has accelerated the digital transformation, one of the outcomes being the rise of alternative finance opportunities. Alternative finance is expected to ease existing constraints of bank financing, helping small enterprises successfully raise financial capital to ensure sustainability and growth.

Today, banks are the main providers of external financing, almost 80% of the total credit supply in Moldova is covered by bank financial sources. At the same time, alternative sources of financing are still poorly developed. Thus, the share of leasing in the structure of the credit sector in Moldova has decreased by 1.2 p.p. from 3.8% in 2017 to 2.6% in 2020. According to SME Policy Index, the Stock market (score of 2.43) does not represent a potential source of business financing. Additionally, the country obtained the lowest scores in the Financial Literacy (2.67) and Venture Capital (1.53) sub-

dimensions. Venture capital is underutilised in the country. Plans to introduce a legal framework for venture capital have existed for years, but they have not been adopted yet.

Over the years, the crowdfunding market was increasing in Moldova, reaching 178.4 million USD in 2019. But, the amount dramatically decreased by 47.9% in 2020 due to uncertainty in the market conditioned by the Covid-19 pandemic. At the same time, European experience shows that the volumes for SME focused finance (crowdfunding) have been increasing steadily over recent years, with business funding accounting for 35% of the total volume in 2019 and 52% in 2020.

The data from questionnaire-based survey for small and medium sized enterprises reveals that enterprises face the biggest problems in accessing venture capital (KEE = -0.96), financing on the securities market (KEE = -0.58) and use of electronic platforms to attract funding (crowdfunding, cryptocurrencies, etc.) (KEE = +0.02), obstacle for 75.0%, 61.5% and 39.5% of respondents who assessed this indicator. The majority of respondents consider that the situation regarding access to finance by enterprises has not changed since 2019. The highest values of the Change Perception Index were registered for indicators Access to funding within state programs, implemented by ODIMM" (IEE =75.0%) and "Use of electronic platforms to attract funding (crowdfunding, cryptocurrencies, etc.)" (IEE = 70.8%, revealing the greatest relative excess of positive evaluations regarding the changes in access to finance, meaning these sources of finance became more accessible.

Obtained results are important for further research, practitioners and in determining measures to facilitate access to finance, development of Fintech and alternative sources of finance (crowdfunding, venture capital, business angels, etc.). Thus, along with promoting traditional sources of finance and making them more accessible for SMEs, it is advised to make efforts towards the development of alternative finance, the legislation should be adjusted, the alternative source of finance should be promoted, as well as entrepreneurs should be educated.

DISCLOSURE STATEMENT

The article is based on the results of the research project within the "State Program" competition (2020-2023): 20.80009.0807.38 "Multidimensional assessment and development of the entrepreneurial ecosystem at national and regional level in order to boost the SME sector in the Republic of Moldova", financed from the budget of the Republic of Moldova.

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TENDENCIES OF MORTALITY AND LIFE EXPECTANCY IN UKRAINE BEFORE THE RUSSIAN FULL SCALE MILITARY INVASION

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ABSTRACT

The ambivalence of mortality and life expectancy dynamics in Ukraine is a significant and complex demographic problem. Our aim is to examine the last tendencies of mortality and life expectancy, analyse the level and dynamics of mortality by major causes of death before the Russian military invasion of Ukraine. This analysis constitutes a base for the further comparative estimation of demographic losses due to the war. Trends of sex- and age-specific mortality are considered. Specific characteristics of mortality in urban and rural settlements are analysed. We use the following methods: demographic rates, standardized death rates (European standard population), life tables, decomposition method, descriptive statistics, graphic method. Our findings suggest that following a period of growth in life expectancy (2009-2013) a period of fluctuation and stagnation (2014-2019) has started in Ukraine under the influence of political-military and economic factors. Beginning with 2020, life expectancy was additionally influenced by COVID-19. Non-communicable diseases are among significant contributors to premature adult mortality in Ukraine. However, the excessive share of deaths (especially among men) is also related to external causes. The dynamics of mortality from cardiovascular diseases show a general trend of decline over the past fifteen years, however with fluctuations in the latest years. A deterioration has already taken place in 2020. There is a slight decrease in cancer mortality over the past fifteen years. The reduction in death rate from external causes in Ukraine over this period was significant. The standardized death rate from digestive diseases has increased with COVID-19 having played a leading role in the unfavourable changes of life expectancy over the past two years.

Keywords: *life expectancy, premature mortality, standardized death rate, major groups of causes of death, cardiovascular disease, cancer, external causes of death*

Abstract

Ambiguitatea dinamicii mortalității și speranței de viață în Ucraina este una dintre cele mai semnificative și complexe probleme demografice ale țării. Scopul nostru este de a studia cele mai recente tendințe în ceea ce privește mortalitatea și speranța de viață, de a analiza nivelul și dinamica mortalității în contextul principalelor cauze de deces înainte de invazia militară a Rusiei în Ucraina. O astfel de analiză va constitui baza pentru evaluarea comparativă ulterioară a pierderilor demografice ca urmare a războiului. În lucrare au fost analizate tendințele mortalității pe vârste și sexe, caracteristicile mortalității în zonele urbane și rurale. Au fost utilizate următoarele metode și date: indicatori demografici, rate standardizate de mortalitate (conform standardului european), tabele de mortalitate, metoda de decompoziție, statistica descriptivă, metoda grafică. Rezultatele obținute denotă că în Ucraina, după o perioadă de creștere certă a speranței de viață (2009-2013), a început o perioadă de creștere lentă a acesteia, urmată de fluctuații și stagnare (2014-2019) determinată de factori militaro-politici și economici. Începând din 2020, speranța de viață a fost afectată într-o măsură și mai mare de COVID-19. Cea mai semnificativă ”contribuție” la mortalitatea prematură a populației adulte din Ucraina o au bolile cronice netransmisibile. Dar proporția excesivă a deceselor (în special în rândul bărbaților) este asociată și cu cauze externe. Dinamica mortalității din cauza afecțiunilor cardiovasculare arată, în general, o diminuare a acesteia în ultimii cincisprezece ani, dar cu fluctuații în ultimii ani. O agravare evidentă a situației a avut loc în 2020. În ultimii cincisprezece ani se observă, de asemenea, o scădere ușoară a mortalității din cauza cancerului. Scăderea mortalității din cauze externe în Ucraina în această perioadă a fost semnificativă. Rata standardizată a mortalității cauzată de boli ale tractului digestiv a crescut în această perioadă. COVID-19 a jucat un rol esențial în schimbările negative în ce privește speranța de viață în ultimii doi ani.

Cuvinte cheie: *speranța de viață, mortalitate prematură, rata standardizată a mortalității, principalele grupe de cauze de deces, boli cardiovasculare, boli oncologice, cauze externe de deces.*

Неоднозначность динамики смертности и продолжительности жизни– одна из наиболее значимых и сложных демографических проблем Украины. Наша цель - изучить последние тенденции смертности и продолжительности жизни, проанализировать уровень и динамику смертности по основным причинам смерти до военного вторжения России в Украину. Такой анализ станет основой для дальнейшей сравнительной оценки демографических потерь в результате войны. В работе рассмотрены тенденции возрастно-половой смертности. Анализируются особенности смертности в городских и сельских населенных пунктах. Были использованы следующие методы: демографические показатели, стандартизированные коэффициенты смертности (по европейскому стандарту), таблицы смертности, метод декомпозиции, описательная статистика, графический метод. Полученные результаты свидетельствуют о том, что в Украине, после периода безусловного роста продолжительности жизни (2009-2013 гг.), под влиянием военно-политических и экономических факторов, начался период медленного ее увеличения, с последующими колебаниями и стагнацией (2014-2019 гг.). Начиная с 2020 года на продолжительность жизни дополнительное влияние оказал COVID-19. Наиболее «значительный вклад» в преждевременную смертность взрослого населения в Украине вносят хронические неинфекционные заболевания. Однако, чрезмерная доля смертей (особенно среди мужчин) связана и с внешними причинами. Динамика смертности от сердечно-сосудистых заболеваний показывает в целом ее снижение за последние пятнадцать лет, но с колебаниями в последние годы. Явное ухудшение произошло в 2020 году. За последние пятнадцать лет наблюдается также небольшое снижение смертности от рака. Уменьшение смертности по внешним причинам в Украине за этот период было значительным. Стандартизированный коэффициент смертности от болезней органов пищеварения за этот период увеличился. В свою очередь, ведущую роль в неблагоприятных изменениях продолжительности жизни за последние два года сыграл COVID-19.

Ключевые слова: *ожидаемая продолжительность жизни, преждевременная смертность, стандартизованный коэффициент смертности, основные группы причин смерти, сердечно-сосудистые заболевания, онкологические заболевания, внешние причины смерти.*

JEL Classification: *J11, I10*
UDC: *314.4*

INTRODUCTION

The medical and demographic processes in Ukraine have been developing in a rather complex and contradictory manner for a long time. The life expectancy in the country has not seen a sufficiently steady positive dynamics for more than half a century.

Beginning in 1970-s, Ukraine began to lose its position among the countries with the highest life expectancy and has later lagged significantly behind. At the mentioned period of time, the task of combating main communicable diseases gave way to the importance of medical-social challenges associated with the spread of chronic non-communicable diseases. At the same time the past two years have seen a renewed importance of infections as a cause of death due to the COVID-19 pandemic.

There were periods of declining mortality between the turn of the twentieth and twenty-first centuries in Ukraine. But the positive dynamics turned out unstable. Therefore, in general the topic of the life expectancy dynamic and mortality by the main causes of death is believed to be one of the most important in demographic context of Ukraine during the last decades.

Among other things it's really important to examine the situation of mortality and life expectancy in Ukraine before Russian military invasion of the country, since it's a base for further assessment of the war's demographic consequences.

The aim of our study is to examine the tendencies of mortality and life expectancy in Ukraine over the last twenty years, analyze the dynamics and structure of mortality by the major causes of death. Life expectancy and mortality by major groups of causes are considered in a comparative context in the paper – in relationship with European Union and the countries of the WHO European Region.

The *research question* of our study is whether the progress in life expectancy observed in Ukraine before the military invasion marked the reversal of adverse long-term mortality trends. We also investigated what sex-age- and cause-specific components of mortality contributed to this improvement.

LITERATURE REVIEW

Ukrainian and foreign scientists have always seen mortality and life expectancy in Ukraine and other countries of Eastern Europe as a relevant and promising research topic. Traditionally the focus has always been on long-time retrospective tendencies in life expectancy, sex-, age- and cause-specific mortality (McKee and Shkolnikov, 2001; Meslé, 2004; Meslé and Vallin, 2012) and their differences between countries (Shkolnikov et al., 2010; Aburto and Raalte, 2018).

Part of the studies available deal with excess mortality, concerned with the periods of social disasters in Ukraine (Vallin et al., 2012), including calculations of demographic losses (Rudnytskyi et al., 2015).

Several studies (for instance Shkolnikov et al., 2001; Levchuk and Luschik, 2019) are devoted to inequalities in mortality and length of life. There has been growing interest in premature and preventable mortality. These have been widely investigated by Ukrainian scientists (E. Libanova et al., 2007; Ryngach, 2016). Some attempts have been made with the purpose to compare the features of mortality and changes in life expectancy in the regions of Ukraine (Ryngach and Luschik, 2018) and in the largest cities of the country (Shevchuk, 2019; Levchuk and Shevchuk, 2021).

Many studies have already appeared on excess mortality due to COVID-19 in the European countries (for instance Penina, 2021; Islam et al., 2021; Konstantinoudis et al., 2022). The methodological approaches to the estimation the direct and indirect effects of the COVID-19 on mortality and some results of excess mortality studies are presented in these papers.

DATA SOURCES AND METHODS USED

The information sources of the analysis are: demographic data of State Statistics Service of Ukraine (by sex, age groups, types of settlement etc.); statistical information from the Eurostat Database; data from European Health for All Database.

Information of the State Statistical Service of Ukraine about the number of deaths for 2014 –2020 have been provided excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol and part of the temporarily occupied territories in the Donetsk and Luhansk regions. Due to lack of information about part of the temporarily occupied territories in the Donetsk and Luhansk regions, it is incorrect to make calculations of relative indicators of population reproduction, death rates etc. for the Donetsk and Luhansk regions. The relative indicators of death rates across Ukraine for 2015–2020 have been compiled excluding the relevant data for the Donetsk and Luhansk region (Population of Ukraine, 2021).

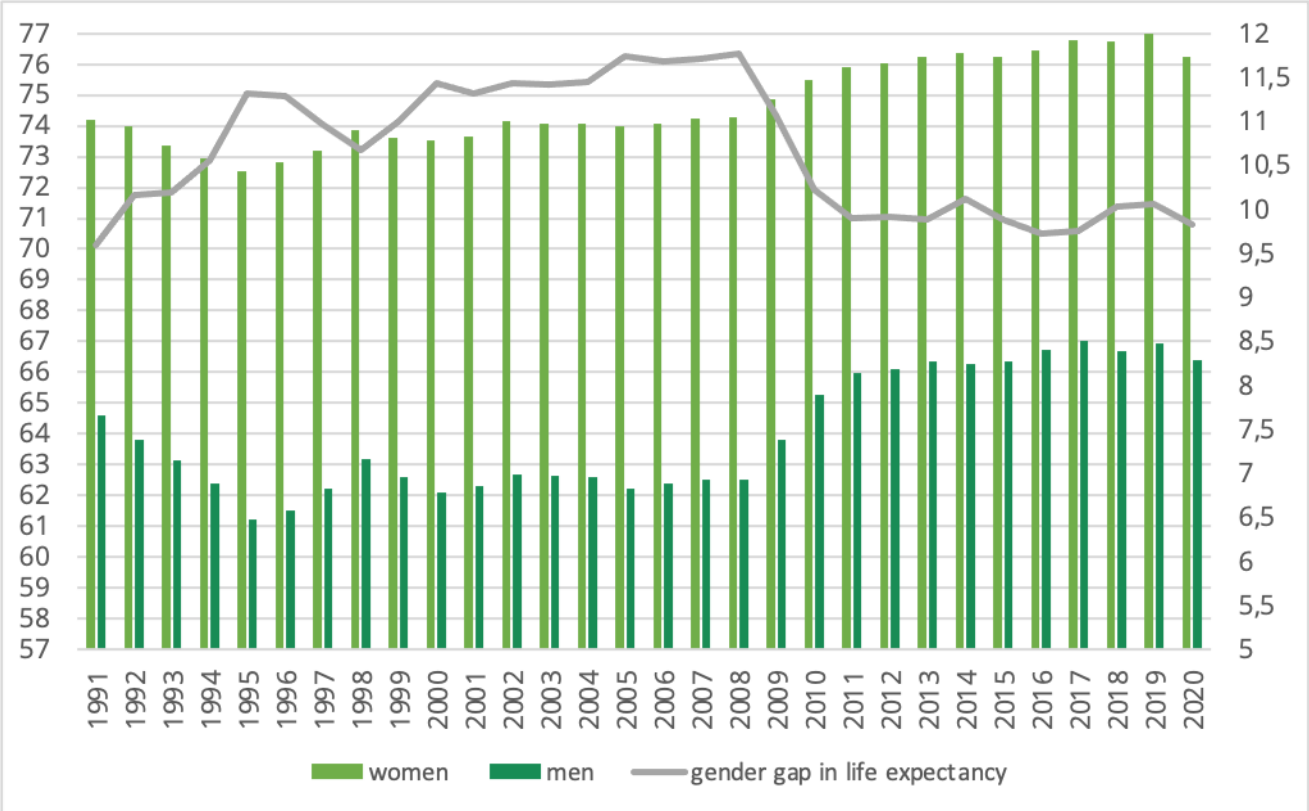
In this paper mortality and life expectancy in Ukraine are examined through the following demographic and statistical measures and methods: calculation and analysis of demographic rates, standardized death rates (European standard population), life tables, the decomposition method (Andreev and Shkolnikov, 2012), descriptive statistics, the graphic method.

THE RESULTS OF RESEARCH AND DISCUSSIONS

During the first decade of Ukraine's independence, unfavourable mortality trends led to an especially sharp drop in life expectancy (Figure 1). A further exit from this unfavorable trend was long and not consistent enough.

Figure 1.

Life expectancy at birth in 1991-2020, Ukraine, by sex (years)



Source: *calculations based on data of State Statistics Service of Ukraine. http://www.ukrstat.gov.ua/*

Periods of declining mortality between the turn of the twentieth and twenty-first centuries in Ukraine were short. Stagnant tendencies prevailed in the dynamics of life expectancy.

Only at the end of the first decade of the XXI century the increase in life expectancy acquired a stable and dynamic character, however, it was not continuous. The beginning of the military conflict with Russia in eastern Ukraine (in 2014) and the associated loss of civilians and military, forced displacement of the population from the relevant territories, and general political and socio-economic instability hindered further favorable changes in life expectancy. In 2020, the COVID-19 pandemic also influenced life expectancy. The period from 2014 to early 2020 can be described as a period of instability and fluctuations with the predominant influence of political and economic factors. Starting

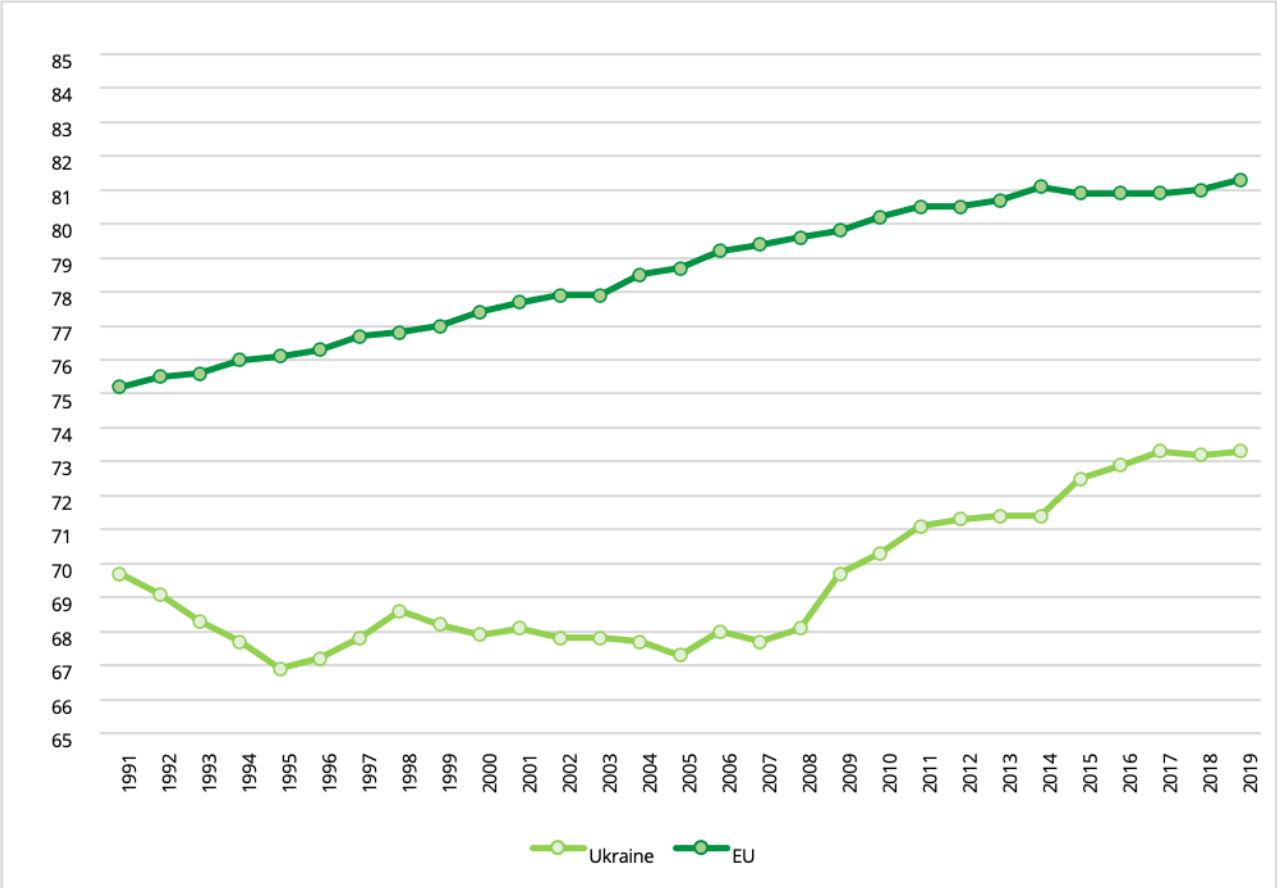
from 2020, life expectancy was additionally influenced by uncertainty in the epidemic situation and the unpreparedness of the healthcare system to respond to COVID-19.

In general, over the last thirty years, the life expectancy of women in Ukraine has increased only by 2.8 years, while in men – by 2.3 years.

The gender gap in life expectancy is still equal to 10 years and is much more significant than the gap in life expectancy between rural and urban areas, which equals 2 years "in favour" of urban residents. Ukraine has lagged far behind the EU countries in terms of life expectancy (Figure 2). Compared to EU citizens, Ukrainian women live an average of 6 years, while men live 11 years less.

Figure 2.

Life expectancy at birth in Ukraine and in the European Union, 1991-2019, both sexes, (years)



Sources: *Eurostat Database https://ec.europa.eu/eurostat/data/database*

The main reason for such differences is the high premature mortality: for instance, in Ukraine the premature mortality rate over three times higher than that of Sweden.

Significant contributions to premature adult mortality are made by major non-communicable diseases (NCDs): cardiovascular disease, cancer, etc. (Table 1). At the same time, in Ukraine the excessive share of deaths (especially among men) is related to external causes (and not only in the young groups of adults). All these causes affect premature mortality in general.

Table 1.

Leading causes of death in women and men aged 15 years and over, Ukraine, 2019.

Rank place	Women			Men		
	15-29 years	30-64 years	65 years and over	15-29 years	30-64 years	65 years and over
I	External causes of death	Cardiovascular diseases		External causes of death	Cardiovascular diseases	
II	Cancers			Cardiovascular diseases	Cancers	
III	Cardio-vascular diseases	Gastro-intestinal diseases	Symptoms, signs, and abnormal clinical and laboratory findings[1]	Gastrointestinal diseases	External causes of death	Symptoms, signs, and abnormal clinical and laboratory findings[2]
IV	Some infectious and parasitic diseases	External causes of death	Gastrointestinal diseases	Cancers	Gastro-intestinal diseases	External causes of death
V	Gastro-intestinal diseases	Some infectious and parasitic diseases	External causes of death	Some infectious and parasitic diseases		Respiratory diseases

Source: *developed based on State Statistics Service data*

Regarding the latest dynamics in life expectancy, both during the period of its unconditional growth (2009-2013) and the last years of slow increase and stagnation (2014-2019), the most important factor of women' life expectancy dynamics was the decrease in mortality from cardiovascular diseases, and for men — the decrease in mortality from external causes.

Over the past period (2014-2019), the overall increase in female life expectancy has appeared to be more than three times lower than in the previous five-year study period. Meanwhile an increase in the contribution of mortality from cardiovascular diseases, as well as from external causes in the dynamics of female life expectancy was observed. The increase in male life expectancy during this period was almost six times less than in the previous five years. There was an increase in the contribution of mortality from external causes, cancers and communicable diseases in the dynamics of male life expectancy. At the same time, changes in cardiovascular mortality have already been unfavourable, therefore they (and, to a lesser extent, the dynamics of respiratory mortality) counteracted an increase in the male life expectancy in recent years.

In 2020, compared to the previous year, life expectancy at birth decreased by 0.5 years for men and 0.8 years for women, mostly through mortality from COVID-19. The component analysis of life expectancy dynamics in 2020, compared to 2019, shows that the contribution of mortality from COVID-19 in reducing life expectancy for both men and women was approximately the same in absolute terms (0.49 years).

The increase in mortality from diseases of the circulatory system also had negative impact on the dynamics of life expectancy, and for men the reduction in life expectancy as a result was even slightly

[1] *This class usually comprises insufficiently defined conditions, symptoms and results of clinical (or other research procedures) that do not comply with the norm, but for which a specific diagnosis has not been established. The significant role (share) of this group death causes (even at an older age) may be an evidence of problems with data quality, especially since in Ukraine the corresponding share of deaths has increased over the last few decades [3, p.51].*

[2] *Men in Ukraine are characterized by a higher proportion of unspecified and unknown causes of death within this class, compared to women (they are dominated by "old age"). This may indirectly indicate lower accuracy in determining the cause of death and lower quality of mortality data namely for men [3, p.54].*

greater than for women. The dynamics of mortality from respiratory diseases and its impact on life expectancy (especially for women) was also unfavorable.

At the same time, mortality from external causes decreased in 2020 (which is due to the impact of quarantine restrictions, in particular, on population mobility, the frequency of informal communication, etc.), and this reduction was more significant in men.

Mortality from diseases of the circulatory system in Ukraine (according to its standardized rate) is on average 1.8 times higher than its level in the European Union and twice higher than this rate for the WHO European Region.

The above ratios reflect both the really high frequency of deaths from diseases of the circulatory system in Ukraine (compared to other classes of non-communicable diseases, as well as against other European countries), and partly the phenomenon of "overdiagnosis" of cardiovascular diseases (CVD), especially in the elderly and the oldest groups of the population. According to recent years, CVD deaths in the country account for more than 80% of all deaths of people aged 70 and older, which may be due in part to the prevalence of routine determination of the cause of death of elderly people ("coronary heart disease; atherosclerotic cardiosclerosis") and a small proportion of cases of post-mortem diagnosis as a result of autopsy (Ryngach, 2013). It should be noted that this causes an underestimation of other age-related pathologies (such as neoplasms, etc.) and somewhat distorts the overall picture of mortality by cause in Ukraine.

As a significant structural factor in the prevalence of cardiovascular disease and mortality is the level of demographic aging, the overall mortality rates of women (who are demographically older) due to diseases of the circulatory system are higher than men, although standardized sex rates show the opposite ratio (table 2).

Table 2.

Mortality from diseases of the circulatory system in Ukraine, 2005-2019, by sex (per 100 thousand people)

Years	Total death rate		Standardized death rate (according to the European standard)	
	women	men	women	men
2005	1070.3	999.6	656.3	1093.8
2006	1065.3	983.6	637.4	1056.9
2007	1063.6	998.1	622.7	1052.6
2008	1071.6	998.6	614.1	1038.2
2009	1052.9	938.6	589.8	970.0
2010	1079.5	937.4	590.7	956.7
2011	1027.1	889.2	549.4	890.0
2012	1017.9	886.7	532.6	873.3
2013	1030.4	895.7	531.0	873.8
2014	1049.9	920.0	534.6	888.6
2015	1068.8	941.2	549.8	930.0
2016	1052.6	927.8	536.6	908.3
2017	1034.1	913.3	521.4	884.1
2018	1048.0	937.6	526.4	899.6
2019	1034.5	937.1	517.6	891.8
2020	1088.1	1010.8	541.0	955.7

Source: *data of the State Statistics Service of Ukraine.*

The total CVD mortality rate in rural Ukraine in recent years is 40% higher than in urban areas. The age-standardized rate is also higher but less than 10%, because the effect of higher aging of the rural population is eliminated.

The dynamics of mortality from cardiovascular diseases shows a general decrease in its level over the past fifteen years. But positive trends were inconsistent, in recent years there have been fluctuations in the dynamics of mortality from diseases of the circulatory system, especially among men. There were clearly unfavourable changes in the mortality rate caused by diseases of the circulatory system for both women and men in Ukraine in 2020, which was already an epidemic year.

In women aged 30 to 70 years, the dynamics of mortality from cardiovascular diseases looks more favourable than in older age: the level of female premature mortality from these diseases decreased in 2019 compared to 2010 – by more than 17%, and in comparison to 2001 – by more than a third, but in recent years this decrease has not been stable. Reduction in male mortality by age from 30 to 70 years from diseases of the circulatory system in 2010 was very "modest" (6% in comparison to 2010) and just as volatile in recent years, the current male premature mortality rate from CVD exceeding not only its level in 2001 but also that of 1991.

Among the cardiovascular diseases that cause death, including premature death, the leading role is played by coronary heart disease (CHD). It currently accounts for about 7 out of 10 deaths from causes of this class and almost 2/3 of CVD deaths between the ages of 30 and 70. Every fifth case of death (including premature deaths from CVD) in Ukraine is caused by cerebrovascular diseases.

The reduction in premature mortality at the age of 30-69 from cerebrovascular diseases in Ukraine in general from 2010 to 2019 has been much more significant (on average by 19%) than due to coronary heart disease (less than 9%). Of particular concern is the absence of positive changes in the dynamics of coronary heart disease mortality in the age group of young men (15-19 and 20-24 years) in this decade. In general, the mortality rate of women from both cardiovascular diseases during this period decreased more significant than that of men.

In the last few years, there has been no resistant decline in mortality caused by both reasons. The deterioration of the situation has already been in place in 2020. Thus, according to the values of standardized mortality rates due to coronary heart disease, its level over the past year has increased by slightly more than 6% for women and by more than 8% for men; the corresponding growth rates for cerebrovascular diseases in 2020 were 1.3% and 6.7%, respectively.

Diseases of the circulatory system not only predominate in the structure of causes of death of the adult population of Ukraine, but also are among the leading causes of disability, as well as the incidence and prevalence of diseases.

Neoplasms are the second most common class of causes of death. A comparative analysis of standardized rates of premature cancer mortality in Ukraine and the EU, as well as relevant indicators for the population aged 65 and over shows that mortality from cancer in people under 65 in Ukraine is slightly higher than in the EU and much higher than in the WHO European region, however, in relation to older age groups, the ratio is opposite, and not least – because of the underestimation of cancer as a cause of death in old age[3].

The total mortality rates of men from oncological pathology exceed those of women on average one and a half times; more correct standardized rates show twice the frequency of men's deaths. The frequency of deaths of women from neoplasms in urban areas of Ukraine is on average 18-20%

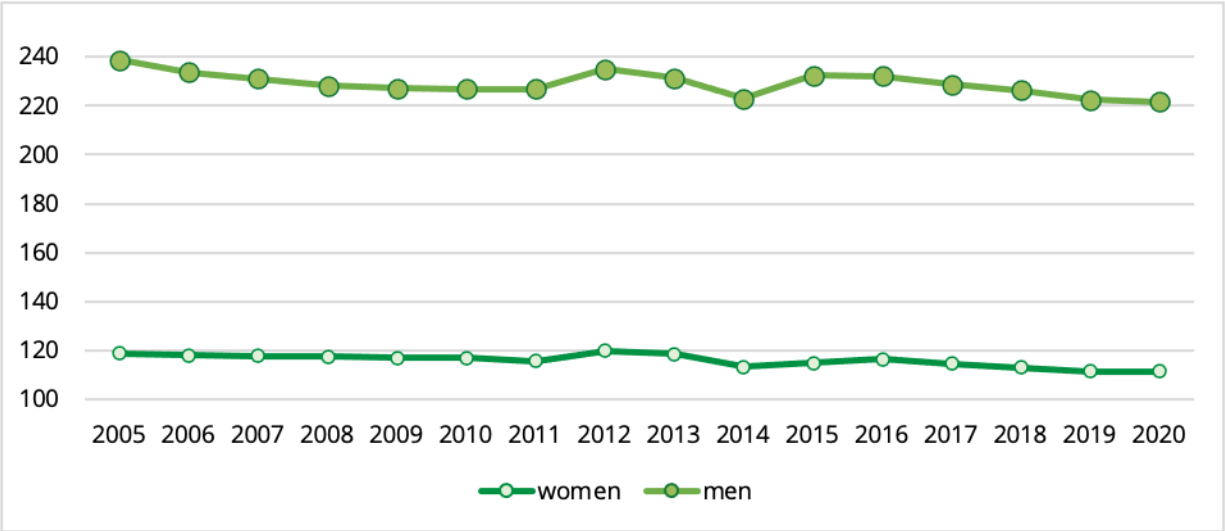
[3] In addition, later detection of cancer, worse survival rates of cancer patients at a relatively young age who thus do not live to old age also plays a role.

higher than in rural areas, while the indicators for men do not have a pronounced inter-settlement differentiation.

The dynamics of standardized cancer death rates show a slight decrease in the mortality rate for this class of diseases in general over the past fifteen years (Figure 3) in the presence of small fluctuations in the studied indicators within this period (especially for men).

Figure 3.

Standardized death rates from neoplasms in Ukraine in 2005-2019, by sex (per 100 thousand people)



Source: *data of the State Statistics Service of Ukraine*

The main cancer type in terms of mortality in women in Ukraine is breast cancer (every fifth case of cancer related female death), while in men these are cancer of the trachea, bronchi and lungs which currently account for 2 out of each 9 deaths caused by neoplasms.

The following places among the localizations of cancer as a cause of death in Ukraine are currently occupied by: malignant neoplasms of the colon; of stomach; of trachea, bronchi and lungs – in women; malignant neoplasms of the prostate; of stomach; of colon – in men.

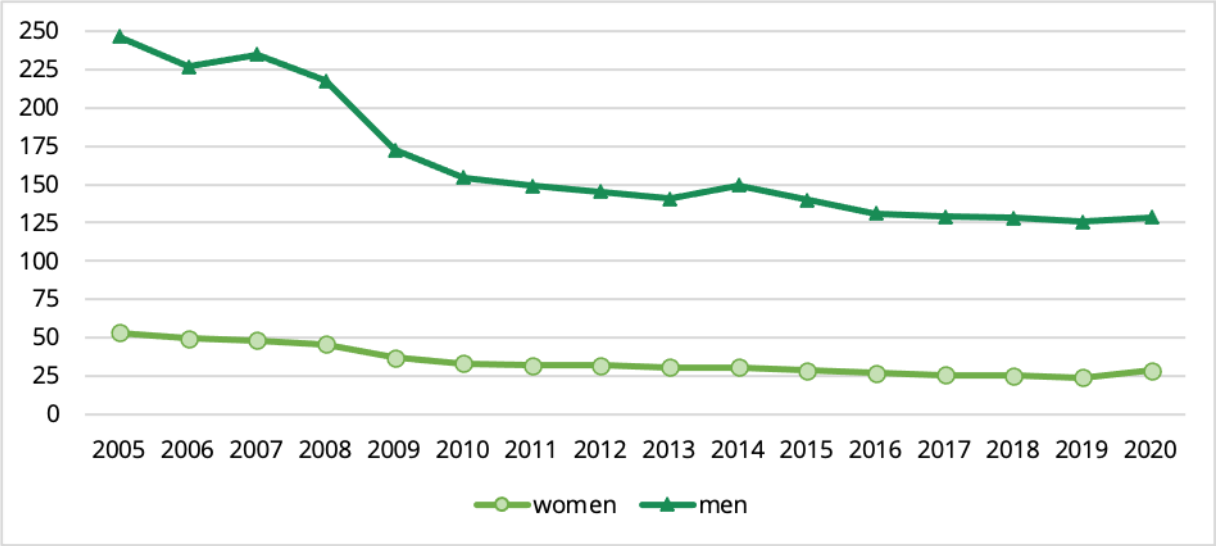
External causes of death. Significant contributions to premature adult mortality in Ukraine are made by external causes. Standardized death rates from external causes are significantly higher than in the EU: almost 2,5 times for men and almost 1.2 times - for women.

Mortality of men from external causes (which is preventable) in Ukraine is far above the level for women (Figure 4). The highest mortality excess of men over women is observed in suicides (5.7 times in 2020) and accidental poisonings (5.6 times).

The reduction in death rate from external causes in Ukraine during 2005-2020 was as significant for men (by more than 1.9 times) as it was for women (by almost 1.9 times).

Figure 4.

Standardized death rates from external causes of death in Ukraine in 2005-2020, by sex (per 100 thousand people)



Source: *data of the State Statistics Service of Ukraine*

Among the external causes of death, the leading roles are played by suicides, homicides (manslaughters and murders), accidental poisonings (for men) and traffic accidents.

The standardized death rate from external causes in rural areas of Ukraine is higher than in urban settlements (in 2020 - 81.8 per 100 thousand people and 60.6 respectively). The biggest differences are in causes such as accidental falling, suicide, accidental drowning.

Chronic diseases of the digestive system are the class of pathologies from which an increasing number of people around the world suffer. Digestive diseases in Ukraine in recent decades have risen up in the hierarchy of causes of death, occupying the fourth place after cardiovascular disease, neoplasms and external causes. In general, the standardized death rate from digestive diseases in the country increased from 32.9 deaths per 100 thousand people in 1991 to 42.9 – in 2001, 48.0 – in 2011, 51.3 – in 2019 and 51.4 – in 2020.

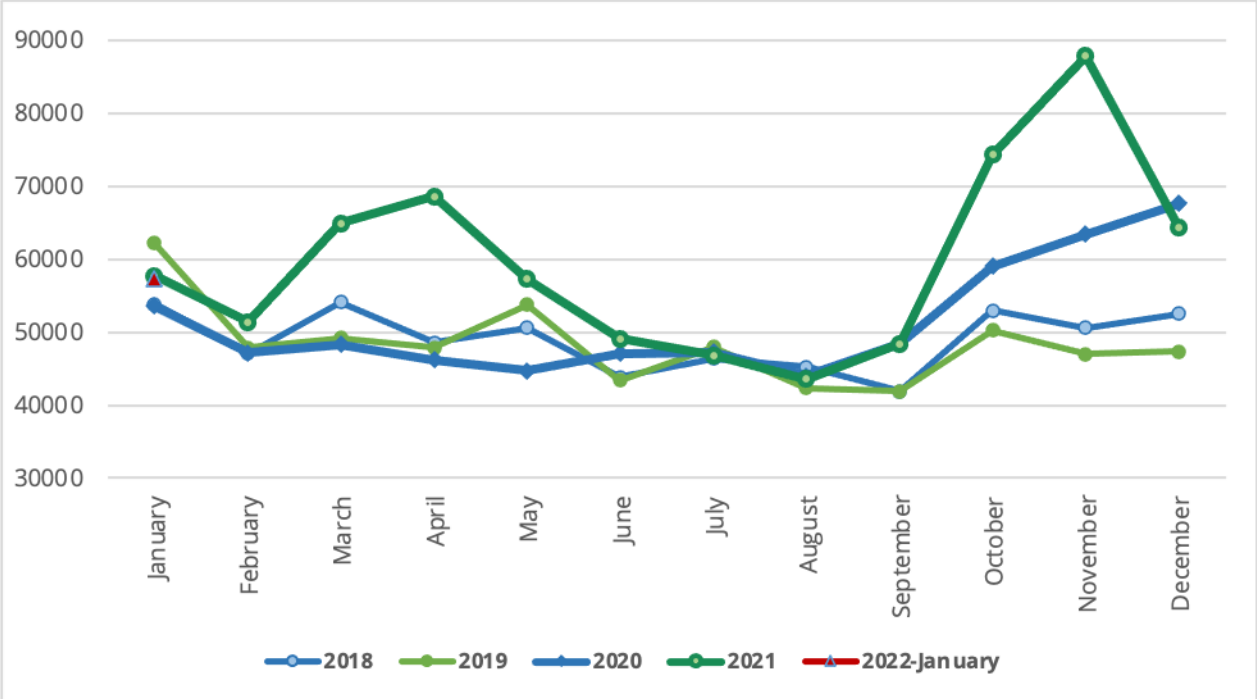
Chronic respiratory diseases represent chronic inflammatory diseases affecting the respiratory tract. Serious respiratory disorders often cause disability and even death, so the contribution of respiratory diseases to the global burden of disease is quite significant. Chronic bronchitis, chronic obstructive pulmonary disease, asthma and other chronic diseases of the lower respiratory tract are perhaps the most dangerous non-communicable respiratory diseases. The total share of deaths caused by these diseases among all deaths from respiratory diseases in Ukraine in last years was 40%.

Standardized death rates (including premature) from bronchitis, asthma and pulmonary emphysema in Ukraine are higher than in the EU, especially for men. Mortality of men from all these diseases in Ukraine is many times higher than that of women (this excess is more significant compared to that in the EU and the countries of the WHO European Region). The death rate from chronic respiratory diseases in rural areas of Ukraine is much higher than in urban settlements. Mortality from these diseases in Ukraine registered a decline in the 2005-2019 period.
In 2020-2021 COVID-19 became one of the significant causes of death. As of 2020, it accounted for almost 3.8% of male deaths and more than 3.1% of all female deaths in Ukraine. COVID-19 has played a leading role in the negative changes in life expectancy over the last two years.

The estimation of excess mortality due to COVID-19 or demographic losses caused by the epidemic falls outside the score of this paper. However, a general idea of the impact of the COVID-19 epidemic waves on the overall mortality of Ukraine in the last two years (before the large-scale Russian invasion) gives a comparison of monthly deaths during the epidemic with at least two previous years (2018-2019) (Figure 5).

Figure 5.

Monthly numbers of deaths in Ukraine, 2018-2021 period



Source: *data of the State Statistics Service of Ukraine. http://www.ukrstat.gov.ua/*

Thus, the maximum monthly deaths in these years - late autumn and early winter 2020, as well as in mid-spring and especially in late autumn 2021 - coincide with the peaks of the corresponding waves of the COVID-19 pandemic in Ukraine.

CONCLUSIONS

This paper examines the last twenty-years' tendencies of mortality and life expectancy in Ukraine and attempts to form a basis for further estimation of excess mortality due to the Russian-Ukrainian war, in particular after the full-scale Russian invasion of Ukraine in 2022.

At the end of the first decade of the XXI century, the increase in life expectancy in Ukraine became stable and dynamic. The period between 2009 and 2013 was characterized by the growth of life expectancy, while the subsequent period of 2014-2019 - by slow increase and stagnation. In both periods the most important factors for the dynamics of women' life expectancy were the decrease in mortality from cardiovascular diseases, and for men — the decrease in mortality from external causes. The dynamics of mortality from a number of causes of death (neoplasms, external causes, diseases of the circulatory system, respiratory diseases) over the period of 2005-2019 was rather favourable in Ukraine. At the same time, for instance, mortality from digestive diseases increased. The gender gap in life expectancy in Ukraine still equals almost 10 years and is much more significant than the gap in the life expectancy of urban and rural residents respectively (2 years).

Ukraine has lagged far behind the European Union countries in life expectancy (women live an average of 6 years and men 11 years less than in the EU). The standardized death rate from diseases of the circulatory system in Ukraine is on average 1.8 times higher than in the EU, corresponding death rate due to external causes – almost 2 times higher, from neoplasms - is slightly higher than in the EU.

In the last couple of years, the stagnation of life expectancy in Ukraine resumed. In 2020, compared to the previous year, life expectancy at birth decreased mostly due to COVID-19, its contribution to reduction of life expectancy for both men and women being the same in absolute terms (almost 0.5 years). The increase in mortality from diseases of the circulatory system also had a negative impact on the dynamics of life expectancy (larger effect – for men). The dynamics of mortality from respiratory diseases and its impact on life expectancy (especially for women) were also adverse in 2020. But dynamics of mortality from external causes of death were rather favourable.

Recent developments, caused by the Russian full-scale invasion, have led to numerous casualties (including civilians) yet. The diverse medical and demographic consequences of ongoing Russian aggression are expected. Not only the direct combat losses and civilian casualties are among them, but also additional deaths due to physical injuries and psychological traumas, lack of medicines for patients with infectious and chronic non-communicable conditions, limited access to urgent emergency medical care and other health services in Ukraine. Unfortunately, their impact on the country's population health and reproduction is likely to be long-term after this war.

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REGIONAL CHANGES IN LIFE EXPECTANCY AND CAUSES OF DEATH IN MOLDOVA AFTER INDEPENDENCE

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ABSTRACT.

After the period of fluctuations related to the socio-economic crisis of the 1990s, life expectancy at birth in Moldova mainly stagnated until 2005 in females and 2010 in males. Recent trends show moderate improvements until the COVID-19 pandemic. The article presents regional differences in mortality in Moldova to identify the most problematic districts. Data and methods: regional data on mortality by cause were analysed for three five-year periods around 1993, 2004 and 2014. Differences in life expectancy at birth between the leading districts and the lagging districts were decomposed by age and cause of death. Results: The gradient in life expectancy was revealed between the northern districts and the municipality of Chisinau, where mortality is low, and the belt of the districts located mainly in the centre, where mortality is high. Cardiovascular and digestive diseases in both sexes, as well as external causes of death in males were responsible for the interregional mortality differentiation. Recent growth in life expectancy was accompanied by an increasing interregional differentiation of mortality from cardiovascular diseases among the elderly and external causes of death among the middle-aged. The progress was the most significant in the municipality of Chisinau, while in the rest of the country, it largely reflected the recovery from the severe socio-economic crisis of the 1990s. Conclusions: The districts falling within the red belt of high mortality have made no progress in terms of population health since independence. In this geographic area, preventive measures aimed at reducing the risk factors associated with cardiovascular disease, liver cirrhosis and external causes of death are needed.

Keywords: *causes of death, life expectancy, Moldova, mortality, regional analysis*

După perioada de fluctuații legate de criza socioeconomică din anii 1990, speranța de viață la naștere în Moldova a stagnat până în 2005 la femei și până în 2010 la bărbați. Tendințele recente arată o ameliorare moderată a situației până la pandemia de COVID-19. În articol sunt prezentate diferențele regionale ale mortalității în Moldova pentru a identifica cele mai problematice raioane. Date și metode: datele regionale privind mortalitatea pe cauze de deces au fost analizate pentru trei perioade de cinci ani apropiate de anii 1993, 2004 și 2014. Diferențele în speranța de viață la naștere între raioanele avansate și raioanele rămase în urmă au fost analizate din perspectiva vârstei și a cauzelor de deces. Rezultate: Diferențe în speranța de viață au fost evidențiate între raioanele nordice și municipiul Chișinău, unde mortalitatea este scăzută, și centura raioanelor situate preponderent în centru, unde mortalitatea este înaltă. Bolile cardiovasculare și ale tractului digestiv la ambele sexe, precum și cauzele externe de deces la bărbați au determinat diferențierea interregională sub aspectul mortalității. Creșterea recentă a speranței de viață a fost însoțită de o diferențiere interregională crescândă a mortalității, cauzate de bolile cardiovasculare în rândul vârstnicilor și de cauzele externe de deces în rândul persoanelor de vârstă mijlocie. Progresul cel mai semnificativ s-a înregistrat în municipiul Chișinău, în timp ce în restul țării acesta a reflectat în mare măsură redresarea de după criza socioeconomică severă din anii ”90. Concluzii: Raioanele care se încadrează în centura roșie a mortalității înalte nu au înregistrat niciun progres în ceea ce privește sănătatea populației în perioada independenței. În această zonă geografică sunt necesare măsuri de prevenție, care să vizeze reducerea factorilor de risc asociați cu bolile cardiovasculare, ciroza hepatică și cauzele externe de deces.

Cuvinte cheie: *cauze de deces, speranța de viață, Moldova, analiza regională*

После периода колебаний, связанных с социально-экономическим кризисом 1990-х гг., ожидаемая продолжительность жизни при рождении в Молдове в основном не регистрировала какого-либо прогресса до 2005 г. у женщин и до 2010 г. у мужчин. Последние тенденции показывают умеренное улучшение здоровья населения вплоть до пандемии COVID-19. В статье представлены региональные различия смертности в Молдове с целью определения наиболее

проблемных районов. Данные и методы: региональные данные по причинам смертности были проанализированы за три пятилетних периода, прилегающих к 1993, 2004 и 2014 гг. Различия в ожидаемой продолжительности жизни при рождении между ведущими и отстающими районами были рассмотрены на основе декомпозиции по возрасту и причинам смерти. Результаты: были выявлены различия в ожидаемой продолжительности жизни между северными районами и муниципием Кишинэу, где смертность низкая, и поясом районов, расположенных в основном в центре, где смертность высокая. Сердечно-сосудистые и пищеварительные заболевания у обоих полов, а также внешние причины смерти у мужчин определяют межрегиональную дифференциацию смертности. Недавний рост продолжительности жизни сопровождался усилением межрегиональной дифференциации смертности от сердечно-сосудистых заболеваний среди пожилых людей и от внешних причин смерти среди лиц среднего возраста. Прогресс был наиболее значимым в муниципии Кишинэу, в то время как в остальной части страны он в большей степени отражал восстановление показателей после тяжелого социально-экономического кризиса ”90-х гг. Выводы: районы, попадающие в красный пояс высокой смертности, не добились какого-либо прогресса в области здоровья населения за период независимости, что вызывает необходимость профилактических мер по снижению факторов риска сердечно-сосудистых заболеваний, цирроза печени и внешних причин смерти.

Ключевые слова: *причины смерти, продолжительность жизни, Молдова, региональный анализ*

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UDC: *614: 612.68+314.4+311.21:612.68(478)*

INTRODUCTION

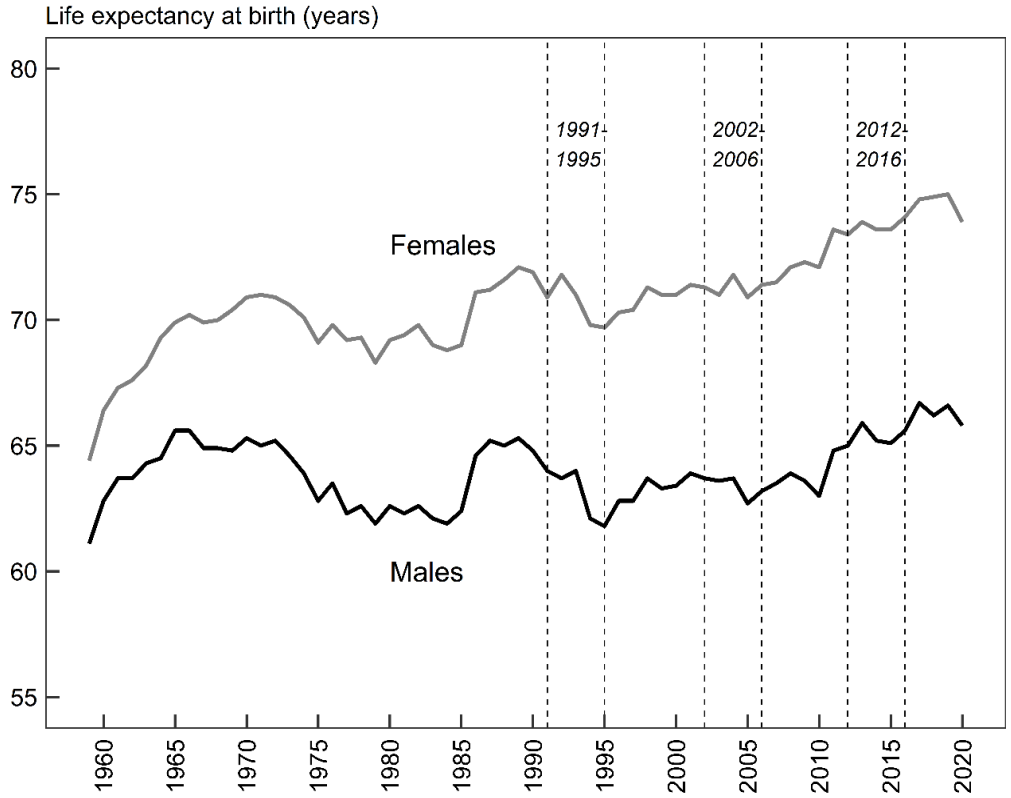
In Moldova, life expectancy has fluctuated over the past five decades without a great deal of progress, either during the Soviet period or after independence. Following rapid improvements in the early 1960s, life expectancy began to decline in both men and women. The anti-alcohol campaign initiated by the Soviets in 1985 resulted in a significant but brief increase in life expectancy in 1985-89. After proclaiming independence in 1991, the situation started to deteriorate very rapidly, with the result that in the mid-1990s life expectancy was roughly in line with the values observed before the anti-alcohol campaign. Short-term progress in life expectancy in the late 1990s did not indicate a reversal of the adverse long-term trend. Among males, the situation remained stagnant until 2010, followed by very moderate improvements. Among females, a steady life expectancy growth started in 2005 and accelerated after 2010. After 55 years of evolution, male life expectancy in 2019 (66.6 years) was just one year higher than in 1965. Female life expectancy gained 5.0 years over the same period and reached 75.0 years in 2019 (Penina et al., 2022). The COVID-19 pandemic reduced life expectancy in 2020 for both males and females by approximately 1.0 years (Gagauz et al., 2021). Previous studies on cause-specific mortality trends in Moldova showed that the long-term decline and short-term fluctuations in Moldovan life expectancy were mainly driven by three causes of death: diseases of the circulatory system and digestive system in both sexes and external causes of death in men. Recent improvements were largely due to a steady decline in mortality from cerebrovascular diseases among older females and mortality from external causes of death among young males. Further, an exceptionally high level of mortality from diseases of the digestive system with no obvious gender gap was found as a particular characteristic of the Moldovan mortality pattern (Penina, 2017).

This paper looks at the evolution of regional disparities of mortality in Moldova during the period of independence since 1991. We focus on three five-year periods, which represent the following periods in the post-independence life expectancy evolution (Fig. 1):

- *The period of socio-economic crisis (1991-1995) during which life expectancy declined rapidly;*
- *The stagnation period (2002-2006) when life expectancy after a short post-crisis recovery in the late 1990s mainly stagnated for both sexes;*
- *The period of recent improvements (2012-2016) in which life expectancy started increasing.*

Figure 1.

Life expectancy at birth since the late 1950s in Moldova, by sex



Notion: *the vertical lines refer to three study periods: socio-economic crisis (1991-1995), stagnation (2002-2006) and recent improvement (2012-2016).*
Source: *(Penina et al., 2022)*

The main hypothesis of the study is that the high level of mortality in the country coexists with important regional variations in mortality, which are not constant over time. Our research questions are as follows:

1. *How has the regional pattern of life expectancy at birth in Moldova changed during the three periods?*
2. *What causes of death and what age groups account for the interregional variation in life expectancy and how has their impact evolved?*

LITERATURE REVIEW

Studies on regional differentiation of mortality, including in small areas, have always been at the centre of concerns of public health experts, as they provide valuable information for effective health policies (Denisenco, 2007). For example, the geographical diversity of mortality in Ukraine between the leading western regions and lagging eastern regions in males or south-eastern regions in females was primarily

attributable to cardiovascular diseases and external causes of death (Poniakina, 2014). More recent studies on regional mortality differences in this country showed that in addition to the south, with historically low life expectancy, the north has emerged as a region with the worst situation in mortality (Levchuk and Luschik, 2019). A distinct division was found between the southwest and north-east in Russia both in terms of total mortality and cause-specific mortality patterns (Vallin et al., 2005). Interregional disparities in Belarus were mainly due to a growing advantage of the capital vis-à-vis the rest of the country (Grigoriev et al., 2013). Moreover, in Belarus, extremely high mortality rates from alcohol poisoning were found in the areas bordering Russia and Lithuania (Grigoriev et al., 2016).

The Republic of Moldova comprises three geographical regions (north, centre and south), Transnistria and the municipality of Chisinau with the capital of the same name (Fig. 2). Transnistria, located in the eastern part of the country, announced its independence in 1990, but Moldova still considers it part of its country. After proclaiming independence in 1991, Moldova adopted the Soviet territorial-administrative division, according to which the country was divided into 40 districts called "rayon", four city soviets and six cities of republican subordination. In 1990, the names of some localities were changed or restored. In 1994, the new law on the territorial-administrative division was adopted, whereby the country consisted of 38 districts, four municipalities (Chisinau, Balti, Bender and Tiraspol) and Autonomous Territorial Unit (ATU) Gagauzia that received a special status. The administrative-territorial division was changed in 1999 when the districts were merged into bigger counties called "judet". The country was divided into ten counties, the municipality of Chisinau, ATU Gagauzia and Transnistria. This division remained in existence until 2002 when the principle of district-based classification was reinstated. Since 2003, the administrative division consists of 32 districts, the municipalities of Chisinau and Balti, ATU Gagauzia and Transnistria. Following the return to the district-based division, two districts (Causeni and Vulcanesti) that existed before 1999 were not restored.

Figure 2.

Geographic location and territorial division of Moldova: regions and districts

Source: *based on GADM data (https://gadm.org/)*

The process of depopulation that affected Moldova during the period of independence involved significant regional differences. After the last Soviet population census in 1989, Moldova carried out two population censuses in 2004 and 2014 without including Transnistria. The latter conducted two population censuses independently of Moldova in 2004 and 2015. The total population in Moldova declined from 4335 thousand in 1989 to 3799 thousand (with Transnistria) and 3243 (without Transnistria) in 2004. In 2014, Moldova's population decreased to 3297 thousand with Transnistria and 2821 without Transnistria. According to the last census (without Transnistria), in 20 of the 35 administrative units, where 34% of Moldova's population resides, the total population is under 70000. At the same time, 66% of the population lives in administrative units with a total population of over 70000, including the municipality of Chisinau which is home to 24% of the population. Compared to the 2004 census, the largest decrease was observed in the number of units with a total population of 100000 inhabitants and more (from eight to two). Districts in the north have the highest proportion of the older population due to lower fertility rates and longer life expectancy. At the same time, the regions of the centre and the south have a younger population structure. From an economic perspective, there is a huge difference between the municipality of Chisinau, with almost 60% of GDP, and the rest of the country (MADRM, 2020). Very few studies on regional mortality differentiation exist in Moldova. In previous studies, a mortality gradient between districts in the north, where life expectancy is higher, and districts in the Centre, where life expectancy is lower was found (Gagauz and Pahomii, 2017). Further, the central and southern regions were found more susceptible to higher premature mortality from COVID-19 infection compared to the municipality of Chisinau and northern districts (Pahomii, 2020).

DATA AND METHODS

Data

The de-identified database of individual medical death certificates provided by the National Public Health Agency (NPHA) was used. The NPHA has been responsible for the centralised coding of causes of death since 1991 under the 9th revision of the International Classification of Diseases and Causes of Death (ICD) and since 1998 under the 10th revision of ICD. Deaths refer to the place of residence of the deceased. Since the data were available at the level of localities, it was possible to arrange it according to the current territorial division for three periods: 1991-95, 2002-06 and 2012-16. For the period 1991-95, we had to make two assumptions concerning the two districts that were not restored in 2003. First, deaths registered in the district of Cainari were attributed to the district of Causeni. Second, deaths registered in the district of Vulcanesti were attributed to ATU Gagauzia. The same assumption was made for population counts. Mortality data were aggregated based on a shortlist of causes of death presented in Table 1. For Transnistria, official statistics were available until 1997. Data on the total number of deaths by cause were collected from the Statistical Office of Transnistria for the period since 2002.

Table 1

List of causes of death used in the analysis with corresponding ICD-9 and ICD-10 codes

Cause	ICD-9	ICD-10
Infectious diseases	001-139	A00-B99
Neoplasms	140-239	C00-D48
Cardiovascular diseases	390-459	I00-I99
Respiratory diseases	460-519	J00-J98
Digestive diseases	520-579	K00-K93
External causes	800-999	V01-Y98
Ill-defined causes, including senility	780-799	R00-R99
Other causes	240-389, 580-779	D50-H95, L00-Q99
All causes	001-999	A00-Y98

Notion: *ill-defined causes of death were redistributed between other causes of death proportionally or by a special method*

Population counts, according to the 2004 and 2014 censuses were used. For the 2014 census, we used the population counts officially adjusted by the National Bureau of Statistics (NBS) due to incomplete registration. For both years, the population refers to the usually resident population, which excludes the temporary absent population (more than 12 months). For the period 1991-1995, we relied on the official annual estimates for 1993 based on the 1989 census. For Transnistria, we used the results of the population census conducted independently in 2004, while for the 2015 census, the data by age were unavailable.

The data underwent preliminary treatment prior to analysis due to an increase in mortality from ill-defined causes (780-799 under ICD-9) in the 1990s. Ill-defined deaths were almost entirely represented by the senility item (797 under ICD-9), with the share in total mortality ranging from less than 1% in the Orhei district to 35% in the Soldanesti district. To address the issue of senility mortality growth, we used the same approach as at the national level. In particular, deaths due to senility were attributed to cardiovascular disease for the age group 80 years and older and redistributed proportionally between all causes of death for the age group less than 80 years. For the periods 2002-2006 and 2012-2016, ill-defined causes of death (R00-R99 under ICD-10) made up less than 1% of the total number of deaths and were redistributed proportionally between all causes of death.

Methods

Abridged life tables were computed using the methods described by Chiang (Chiang and World Health Organization, 1979). To estimate the 95% confidence intervals for life expectancy, we used the Silcocks et al. method (Silcocks et al., 2001). Life tables were produced by sex, district and geographical region. The contribution of mortality by age and cause of death to the difference in life expectancy between the two groups of populations were computed based on the method of decomposition (Andreev and Shkolnikov, 2012).

Data were analysed in R using the packages “PHEindicatormethods” (life tables, confidence intervals) (Anderson et al., 2020) and “DemoDecomp” (decomposition of changes in life expectancy) (Riffe, 2018). Thematic maps were produced using the package “tmap” (Tennekes, 2018) and shapefiles from the GADM website (https://gadm.org/). The “Jenks” optimisation method of classification, which maximises the differences between the categories of observations was used to produce all the thematic maps.

RESULTS

Changes in life expectancy

Table 2 provides life expectancy at birth by geographic regions over three time periods. In the 1991-1995 period, which refers to the socio-economic crisis, life expectancy was above the national average only in the municipality of Chisinau and in the northern region for both sexes. Life expectancy was close to the national level for women in Transnistria and below for other sex and regional categories. The most unfavourable situation in the early 1990s was found in the central region, where life expectancy was almost 2 years lower than the national average and 4 years lower than in the capital for both sexes. During the stagnation period, in 2002-2006, the situation remained practically unchanged in all regions and the municipality of Chisinau. The period 2012-2016 saw some improvements, particularly in the capital, where life expectancy increased by more than 3.0 years for both sexes compared to 2002-06. In other regions, the increase was smaller, amounting to approximately two years for women and one year for men. Leaving aside the municipality of Chisinau, which undoubtedly holds the leading position, recent progress has been more pronounced in the centre and the south than in the north. The northern region, which had a life expectancy similar to that of the capital in the early-1990s and at the beginning of the millennium, experienced much less

growth, particularly among men. Despite the different degrees of the recent amelioration, the differentiation between the leading north and the municipality of Chisinau on the one hand and the lagging central and southern regions on the other is still evident. The central region remains the most backward.

Table 2

Life expectancy at birth and its changes by geographic regions, Moldova since 1991

Geographic region	Life expectancy			Changes in life expectancy		
	1991-1995	2002-2006	2012-2016	1991-1995 / 2002-2006	2002-2006 / 2012-2016	1991-1995 / 2012-2016
Males						
North	64.2±0.4	64.2±0.4	65.0±0.5	0.0	0.8	0.8
Centre	61.7±0.4	62.5±0.4	63.7±0.4	0.8	1.2	2.0
South	62.3±0.5	62.8±0.5	64.1±0.6	0.5	1.3	1.8
Transnistria	62.3±0.6	61.8±0.6	-	-0.5	-	-
Mun. Chisinau	65.3±0.5	64.8±0.5	68.6±0.5	-0.5	3.8	3.3
Moldova	63.2±0.2	63.2±0.2	65.2±0.2	0.0	2.0	2.0
Females						
North	72.0±0.4	72.6±0.4	74.3±0.4	0.6	1.7	2.3
Centre	68.6±0.4	69.3±0.4	71.6±0.4	0.7	2.3	3.0
South	69.6±0.5	70.4±0.5	72.5±0.5	0.8	2.1	2.9
Transnistria	71.0±0.5	71.7±0.6	-	0.7	-	-
Mun. Chisinau	72.7±0.5	73.5±0.5	76.7±0.5	0.8	3.2	4.0
Moldova	70.6±0.2	71.4±0.2	73.7±0.2	0.8	2.3	3.1

Source: *calculations based on NPHA, NBS and Transnistrian statistical office data*

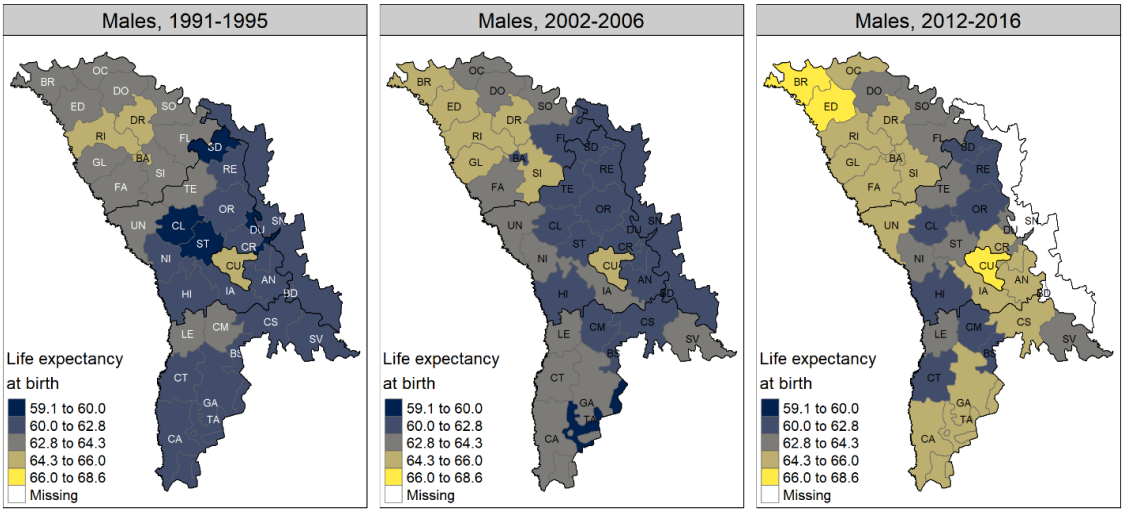
Figures 3 and 4 illustrate the changes in the regional profile of life expectancy at birth in Moldova for males and females, respectively. The maps are based on the statistical classes common to the three periods. In this way, one can see how the geography of mortality modified while keeping track of patterns from one period to the next. A considerable transformation over 30 years can be observed. The period of socio-economic crisis in the early 1990s was marked by a distinct differentiation between the northern districts and the municipality of Chisinau, on the one hand, and the rest of the country, on the other hand. Among males, the two municipalities and the northern districts of Riscani and Drochia adjacent to the municipality of Balti were in the most advantageous position. Among females, the health situation in the northern districts of Briceni, Ocnita and Riscani was even better than in the capital. Nearly all central and southern districts had low and very low life expectancy. Even in the districts directly adjacent to the capital, the socio-economic crisis of the 1990s seriously degraded the population's health. It is especially apparent in the case of the map for females, where the capital of the country is encircled by districts with very low life expectancy values. A decade later, in 2002-2006, the situation began to improve in the north and less so in the south. At the same time, most of the central districts, Transnistria (men) and some southern districts continued to face serious health problems. The homogenisation process continued slowly and in the next decade. By 2012-2016, the picture had completely changed. The situation has improved not only in the north and the south, but also in the central districts directly adjacent to the capital, particularly in males (the districts of Ialoveni, Anenii Noi, Criuleni).

Following these transformations, a belt of high-mortality districts was formed by 2012-2016, extending from the Soldanesti district in the northeast to the Cantemir district in the southwest. These districts identified as the most lagging had a life expectancy at birth in 2012-2016

corresponding to the 1991-95 national level or lower (63.2 years) in males and under the lower limit of the 2002-2006 national life expectancy in females (71.2 years). For both sexes, the following eleven districts were the most lagging ones: Soldanesti, Rezina, Telenesti, Orhei, Calarasi, Nisporeni, Hincesti, Leova, Cimislia, Basarabeasca and Cantemir. The last four districts refer to the southern region and are directly adjacent to the central region.

Figure 3.

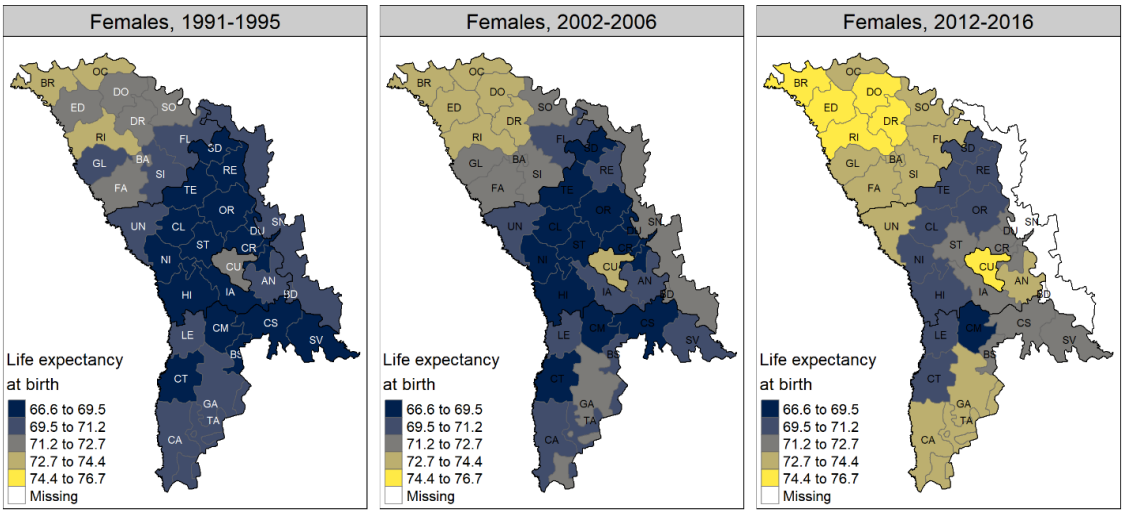
Regional profile of life expectancy at birth in 1991-1995, 2002-2006 and 2012-2016, Moldova, males



Source: *calculations based on NPHA, NBS and Transnistrian statistical office data*

Figure 4.

Regional profile of life expectancy at birth in 1991-1995, 2002-2006 and 2012-2016, Moldova, females



Source: *calculations based on NPHA, NBS and Transnistrian statistical office data Interregional mortality differentiation*

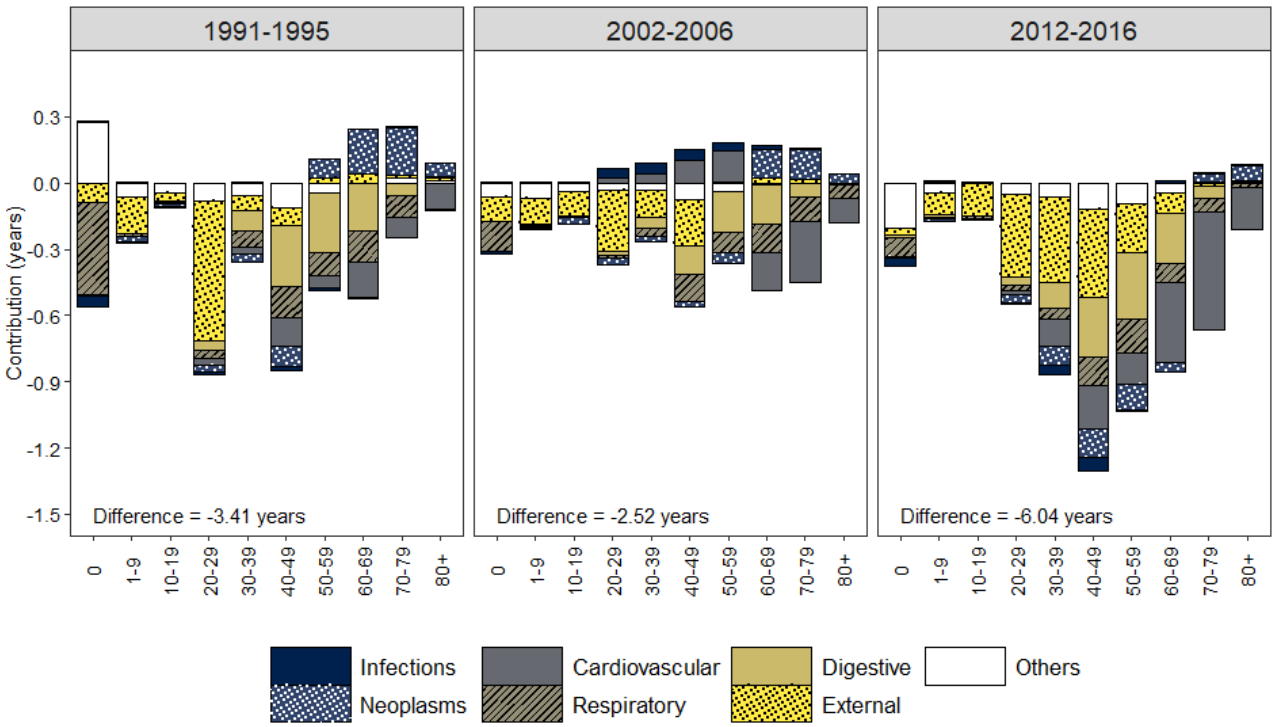
The difference in life expectancy at birth between two subgroups of the Moldovan population having the highest and lowest life expectancy was decomposed by age and cause over three study periods.

The two population subgroups were represented by the 11 most backward districts and the municipality of Chisinau as the leading unit. About 20% of the population resides within each selected group, according to the 2014 census.

Among men (Fig. 5), the gap in life expectancy at birth during the crisis of the early 1990s was -3.4 years. More than 70% of this difference (-2.4 years of -3.4 years) was attributed to higher mortality at the age of 20 to 59 years in the backward districts compared to the capital. The impact of younger and older age groups was less important (-0.7 and -0.3 years, respectively). In terms of causes of death, major men's losses in the 1990s were attributed to diseases of the respiratory system (-1.0 year), diseases of the digestive system (-0.9 year) and external causes of death (-1.0 year). Other diseases, including diseases of the circulatory system, had less impact. Diseases of the respiratory system were particularly important for infants, though the negative contribution was perceptible and for adult men. The influence of external mortality was especially significant in young men aged 20-29 years, while mature adult men suffered more from diseases of the digestive system.

Figure 5.

Contributions of mortality by age and cause to differences in life expectancy at birth between the most backward districts and the municipality of Chisinau over three periods, males



Source: *calculations based on NPHA, NBS data*

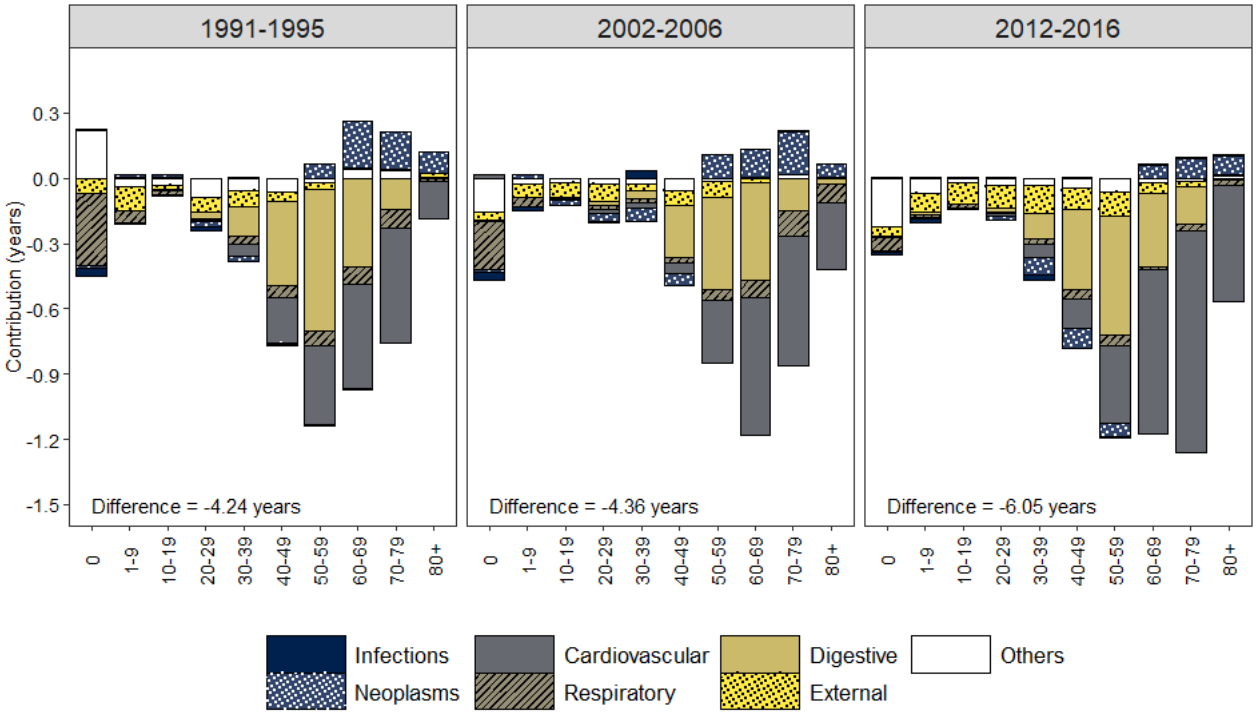
In the period 2002-2006, the interregional differentiation of mortality between the two male population subgroups decreased (-2.5 years). The negative contribution of infant mortality from respiratory diseases and that of adult mortality from external causes declined. No marked differences were noted in cardiovascular mortality. In the municipality of Chisinau, the situation with cardiovascular disease and infections even deteriorated. The positive contribution of cancer mortality in older men was preserved during the stagnation period due to the higher mortality in the capital than in the lagging districts. The third period was marked by a significant increase in interregional disparities in male mortality between the two subgroups. The gap in male life expectancy has doubled (-6.0 years). The main contributors were external causes of death (-1.8 years), diseases of the

circulatory system (-1.6 o years) and diseases of the digestive system (-1.0 years). This period was characterised by important progress in old-age cardiovascular mortality in the capital and its absence in the lagging subgroup. The gap also started to increase due to the worsening situation with cancer mortality at working age in the lagging subgroup, while in older men the differentiation decreased.

Among women (Fig. 6), the difference in life expectancy at birth between the two analysed population subgroups was greater than among men in the first two periods (-4.2 and -4.4 years, respectively) and the same in the third period (-6.0 years).

Figure 6.

Contributions of mortality by age and cause to differences in life expectancy at birth between the most backward districts and the municipality of Chisinau over three periods, females



Source: *calculations based on NPHA, NBS data*

Unlike men, the period of stagnation among women was not characterised by an attenuation of interregional differentiation in mortality. In effect, the decomposition results for the first two periods were virtually identical. Another important difference from men was the larger impact of old-age mortality. If among males, the contributions of older age groups became apparent only during the third period, then among females, these age categories played an important role throughout the entire period, with a growing contribution of the last age group 80 years and older. Diseases of the circulatory system and diseases of the digestive system played a crucial role in the interregional differentiation of female life expectancy over the whole period of independence. These two health conditions alone were responsible for 75-80% of the life expectancy gap in females. Mature adult females from the lagging districts were more susceptible to digestive disorders than their counterparts from the capital. At the same time, the elderly women living in the municipality of Chisinau benefited from better cardiovascular mortality control. The widening gap in female life expectancy during the third period was largely explained by the increasing differentiation in cardiovascular mortality. In contrast to males, external causes were of little importance for the health of Moldovan females. Nevertheless, the negative contribution of this type of mortality increased in the last period (12% of the total difference). Women living in the municipality of Chisinau had a higher risk of dying from neoplasms in older age groups than women living in the lagging districts. Similar to

males, this differentiation subsided during the third period, but the negative impact of neoplasms in working-age groups became visible.

DISCUSSION

The paper discusses regional changes in life expectancy and causes of death in Moldova since independence. The three five-year periods chosen reflect the evolution of life expectancy in Moldova following independence that covers the socio-economic crisis of the 1990s, the stagnation of population health during the first decade of the millennium and the recent period of improvements. The geographic diversity of the health of the Moldovan population seemed to be established before the country's independence. During the severe crisis of the 1990s, the health conditions of Moldovan men and women in the north of the country and the municipalities of Chisinau and Balti were much better than in the rest of the country. Among women, the health situation was even somewhat more favourable in some northern districts than in the municipalities. At the same time, the central and southern regions and Transnistria experienced much more health problems. The end of the socio-economic crisis and the beginning of the new millennium have not substantially improved the health of the Moldovan population, including those living in the capital. Some positive changes in overall mortality observed during the stagnation period in some districts, especially in the most backward ones, were most likely due to the temporary post-crisis recovery. Previous studies have shown that in Moldova, the short-term increase in life expectancy that occurred in the late 1990s during the continuing socio-economic crisis was attributed to the population's adaptation to new social and economic conditions, rather than the beginning of a new sustained positive trend.

The recent increase in life expectancy in Moldova was largely due to the improvement in the health of the population living in the municipality of Chisinau and, to a lesser extent, in certain northern districts among women (Briceni, Edinet and Drochia districts). Our findings indicate that progress in life expectancy in most northern districts after independence was fairly modest. Here, the situation remained stagnant rather than improving, particularly for men. Nevertheless, with better initial positions, the situation in the north was still better than in the south or in the centre. In other districts, except for those falling into the red belt of high mortality, the progress achieved during 30 years of independence has made it possible to exceed the national average 1991-1995 or to get closer to the national average 2014-2016. Finally, in the most backward eleven districts, there has been no progress in life expectancy. Here, the health of the population remained at the same level as during the socio-economic crisis of the 1990s, if not worse.

The breakdown of the difference in life expectancy at birth between the municipality of Chisinau and the most backward districts revealed the three key causes of death that account for interregional differentiation of mortality: diseases of the circulatory system, diseases of the digestive system and the group of external causes in males. The same causes of death were responsible for the long-term negative trend in life expectancy in Moldova since the mid-1960s and its growing gap with Western countries. The municipality of Chisinau has made significant progress in life expectancy over the last decade, primarily by improving cardiovascular mortality control among the elderly. This progress was more evident in females compared to males. In a few northern districts (in particular, Drochia, Briceni districts) and the municipality of Balti, the advances in cardiovascular mortality over the period of independence were also marked. Unfortunately, there has been much less progress in other districts, where standardised cardiovascular mortality rates after deteriorating in 2002-2006 have merely returned to the 1991-1995 baseline. It is important to remember that in the early 1990s, the peak in cardiovascular mortality caused by a devastating socio-economic crisis was especially high in the country. Surely these changes cannot be viewed as genuine improvements leading to a stable increase in life expectancy growth at the national level. Regional variations in cardiovascular mortality over the past 30 years indicate enormous inequalities in population health between the capital and the rest of the country. Consequently, recent gains in life expectancy at the national level were more than modest, while the cardiovascular revolution did not reach Moldova.

Diseases of the digestive system were the second cause of death playing a key role in interregional mortality differentiation. The impact of this pathology mostly represented by cirrhosis of the liver was found highly important both in males and females, the middle-aged being the most affected age group. Earlier studies have indicated that the growth of mortality from liver cirrhosis was exceptionally rapid in Moldova in the 1970s and did not cease until the Gorbachev anti-alcohol campaign. The subsequent trend was upward or stagnant, followed by a recent moderate improvement for women. Furthermore, the male-female ratio of mortality from liver cirrhosis was found to be close to one, especially in the 1980s and 1990s, indicating indirectly the influence of the same determinant factor on both genders. The unfavourable evolution of mortality from liver cirrhosis in Moldova is closely linked to hazardous alcohol consumption. According to the WHO Global Status Report on Alcohol (WHO, 2018), Moldova was among the most consuming countries with 15.1 litres of total alcohol consumed per adult aged 15 years and older in 2016. Moldova is much closer to the wine-drinking culture, also known as the "wet" or Mediterranean culture, characterised by a high per capita alcohol consumption, lower rates of drunkenness and high levels of chronic consequences of alcohol use such as liver cirrhosis (Room and Mäkelä, 2000; Landberg, 2010). In Moldova, homemade wine consumption dominates the total unrecorded consumption (about 80% for both sexes) and represents about 30% of the total alcohol consumed (WHO, 2014).

Our results show that external causes of death have contributed to regional differentiation of all-cause mortality mostly for men and far less for women. The improvements in the municipality of Chisinau, combined with the worsening situation in the most backward districts, increase the interregional differentiation of this type of mortality and slow down the progress at the national level. Morbidity and mortality from injuries are primarily associated with the "dry" or Nordic type of drinking culture that is characteristic of many European countries of the former Soviet Union, such as Ukraine or Russia, where strong alcoholic beverages are traditionally consumed (Levchuk, 2009). The consequences of acute alcoholism, such as external causes of death, are often related to this type of drinking pattern (Rehm et al., 2003).

Mortality from neoplasms did not have a sizable impact on interregional variations in life expectancy. In comparison with the most backward districts, this type of mortality, particularly among the elderly, was higher in the municipality of Chisinau, which forwarded much further along the path of the epidemiologic transition. The increasing negative contributions of neoplasm mortality in middle-aged groups indicate the worsening status of cancer mortality in the most affected districts. This contrasts with a declining positive contribution from cancer mortality at an older age, which reflects advances in cancer treatment in the capital. The continuation of these divergent trends will accelerate interregional mortality differentiation in the future.

CONCLUSIONS

The main groups of causes of death that account for the long-term negative trend in life expectancy in Moldova are also responsible for its interregional variations. These groups include diseases of the circulatory system, diseases of the digestive system and external causes for men. There is a mortality gradient between the northern districts and the municipality of Chisinau in which life expectancy is higher and the central districts in which life expectancy is lower. The pace of progress differs from one district to another, with the fastest in the country's capital and the lack of progress in the districts identified as the red belt of high mortality. Particular attention should be paid to the group of backward districts by public health experts.

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GENDER PROFILE OF INCOME AND CONSUMPTION: EVIDENCE FROM THE NATIONAL TRANSFER ACCOUNTS OF MOLDOVA

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ABSTRACT

The use of the National Transfer Accounts (NTA) methodology has opened up the possibility of examining gender differences in income and consumption throughout the life cycle. This article presents the results of the study of the gender profile of income and consumption based on the NTA of Moldova for 2019. Moldova is characterized by a low level of employment, low incomes and a high involvement of the population in international labor migration.

Women's labor incomes are lower than men's throughout the life cycle, and the life cycle surplus is entirely formed by men, who are net donors to cover the life cycle deficit of other age groups during the working period. More than two-thirds of the economic life cycle deficit is held by women, and the gender gap in economic dependence records 22.7%. For men, the level of labor income exceeds consumption during 27 years, while for women, consumption exceed income throughout the entire life cycle. The differences at gender age profile of public consumption per capita are observed, especially for women at ages related to childbearing, and for men at retirement ages. The public transfers to health care (consumption of services) are significantly high for women both per capita and aggregate value. Women`s contribution in the public funds formation in the most active working ages is significantly lower than that of men. The private current transfers cover a large part of the LCD, both men and women.

Keywords: *National Transfer Accounts, gender differences, income, consumption, life cycle dificit.*

Utilizarea metodologiei conturilor naționale de transfer (NTA) a deschis posibilitatea examinării diferențelor de gen în ceea ce privește veniturile și consumul de-a lungul ciclului de viață. Acest articol prezintă rezultatele studiului profilului de gen al veniturilor și consumului pe baza ANT al Republicii Moldova pentru anul 2019. Moldova se caracterizează printr-un nivel scăzut de ocupare a populației, venituri mici și o implicare ridicată a populației în migrația internațională a forței de muncă.

Veniturile din muncă ale femeilor sunt mai mici decât ale bărbaților pe tot parcursul ciclului de viață, iar surplusul ciclului de viață este format în întregime din bărbați, care sunt donatori neți pentru a acoperi deficitul ciclului de viață al altor grupe de vârstă în perioada de muncă. Mai mult de două treimi din deficitul ciclului de viață economic este deținut de femei, iar decalajul de gen în dependența economică a fost de 22,7%. La bărbați, nivelul veniturilor din muncă depășește consumul timp de 27 de ani, iar la femei, consumul depășește veniturile pe tot parcursul ciclului de viață. Există diferențe în profilul de vârstă și sex al consumului public pe cap de locuitor, în special la femeile aflate la vârsta fertilă, în timp ce la bărbații la vârsta de pensionare. Transferurile publice pentru ocrotirea sănătății (consumul de servicii) sunt semnificativ mai mari pentru femei, atât pe cap de locuitor, cât și în termeni agregați. Contribuția femeilor în formarea fondurilor publice la vârstele apte de muncă este semnificativ mai mică decât cea a bărbaților. Transferurile private curente acoperă cea mai mare parte a deficitului ciclului economic de viață atât pentru bărbați, cât și pentru femei.

Cuvinte cheie: *Conturi naționale de transfer, diferențe de gen, venit, consum, deficit ciclului de viață.*

Использование методологии Национальных трансфертных счетов (НТС) открыло возможность для изучения гендерных различий в доходах и потреблении на протяжении всего жизненного цикла. В данной статье представлены результаты исследования гендерного профиля доходов и потребления на основе NTA Молдовы для 2019 года. Молдова характеризуется низким уровнем занятости населения, низкими доходами и высокой вовлеченностью населения в международную трудовую миграцию.

У женщин трудовые доходы ниже, чем у мужчин на протяжении всего жизненного цикла, а профицит полностью формируются мужчинами, которые являются чистыми донорами для покрытия дефицита жизненного цикла других возрастных групп в течение трудового периода. Более двух третьих дефицита экономического жизненного цикла приходится на женщин, а гендерный разрыв в размере экономической зависимости составляет 22,7%. У мужчин уровень трудовых доходов превышает потребление в течение 27 лет, тогда как у женщин потребление превышает доходы на протяжении всего жизненного цикла. Наблюдаются различия в половозрастном профиле общественного потребления на душу населения, особенно для женщин в репродуктивном возрасте, тогда как для мужчин в пенсионном возрасте. Государственные трансферты на здравоохранение (потребление услуг) значительно выше для женщин как в расчете на душу населения, так и в совокупном выражении. Доля женщин в формировании государственных фондов в наиболее трудоспособных возрастах существенно ниже, чем у мужчин. Частные текущие трансферты покрывают большую часть дефицита экономического жизненного цикла, как мужчин, так и женщин.

Ключевые слова: *национальные трансфертные счета, гендерные различия, доход, потребление, дефицит жизненного цикла.*

JEL Classification: *J11, J16*
UDC: *316.346.2+330.564.2+330.567.22](478)*

INTRODUCTION

In Moldova, as in other countries of Eastern Europe, the problem of the gender gap in economic independence remains relevant despite the fact that aspects related to ensuring gender equality are enshrined in main political documents, strategies and sectoral policies, and have budgets attached to them. A number of factors hinder the achievement of this goal, among which the uncertainty in the labor market and limited employment opportunities are key. During the three decades of independence, the employment rate in Moldova has fallen to an extremely low level, less than 40% (2021), which is more than twice below that of Sweden, which is the European leader in terms of employment. The employment rate of men is significantly higher and records 44.7%, while that of women is only 35.4% (NBS, 2022).

In the conditions of a market economy, employment is not anymore assured for both women and men, while the widespread involvement of the Moldovan population in labor migration has significantly altered the behavior of both labor migrants and their households' members on the national labor market. For instance, due to low wages, many members of labor migrants' households prefer not working. The monetary and economic motivations of migration in early stage of country independence became the main life strategy of the population, evolved into a culture of socio-economic behavior; as part of this culture, the well-being of an individual/family is associated, as a rule, with labor migration, which turned into a certain form of entrepreneurship. For the sake of illustration, the income from labor migration, according to the payment balance, in 2019 was 17.4 billion MDL which is 14.8% of the total labor income of the "Household" sector.

The number of preschool age children (0-6 years) is among the determinant factors of the of women`s participation in the labor market. The Labor Force Survey shows that the employment rate for men with at least one child is 62.52%, while for women it is 39.4%. In Moldova, there is also a high proportion of women in the category of inactive population - 57.3% in 2019. The number of housewives records 156.4 thousand, or 95.7% of the total number of population taking care of the household. The insufficiency of pre-school education services, the reduced employment opportunities, especially in rural areas, forces women with small children to stay at home.

In addition, general problems such as the wage gap, segregation of women into sectors of the economy featuring low wages, underemployment, which are typical for many countries in the region, also have a negative impact on the achievement of gender equality in economic independence.

This paper examines the gender profile of income and consumption based on the 2019 National Transfer Accounts (NTA) for Moldova.

THEORETICAL FRAMEWORK OF RESEARCH

The gender profile of income generation and consumption is based on the "gender contract" - "a set of implicit and explicit rules governing gender relations, and which allocate different work, value, responsibilities and obligations to women and men, and are maintained on three levels: cultural superstructure (the norms and values of society); institutions (family welfare, education and employment systems, etc.); and socialization processes, notably in the family" (EIGE, 2022).

The gender division of paid and unpaid work manifests itself differently in various countries of the European region. Western European countries have been more successful in achieving gender equality in the socio-economic and private spheres, while in Eastern European countries, including Moldova, there is still a relatively high level of gender inequality. Despite the fact that women in Moldova have a higher level of education than men, their level of economic employment is lower and they are more involved than men in domestic unpaid work, producing material goods and services to meet the needs of family members. Based on national surveys and the classification of gender contracts proposed by Aboim (2010), it can be said that in the Moldovan gender contract of family the unequal model is dominant: the man and woman work, but the woman still has most of the household chores.

Studies of the gender profile of income generation and consumption based on the NTA show that in many European countries the income profile of women is noticeably smaller than that of men, with the exception of Slovenia and, to some extent, Sweden, Finland and Hungary (Hammer, 2013).

Women's contribution to total labor income ranges from 24% in Italy and the UK to around 41% in Sweden, reflecting women's labor force participation and income at various ages. At the same time, women's contribution to the production of non-market goods and services (unpaid domestic labor) in all countries exceeds the contribution of men. With higher employment and higher wages, men contribute more to public funds (*current* public transfers/outflows) and finance a higher share of children's consumption than women. In most countries, per capita annual public old-age benefits are significantly lower for women, while total pension transfers are higher due to their longer life expectancy (Hammer et al., 2020). However, despite the greater contribution of men to the formation of pension funds, the possibilities of using them (receiving an old-age pension) are much lower due to fewer years lived on pension because of a shorter life expectancy.

Some differences between men and women are found in public consumption spending in the health care and long-term care categories. Women tend to account for a large share of government spending (Zannella, 2017). Gender and parenthood status become the crucial dimensions of private transfers. Men are the main givers of private transfers, as they are also the main earners of labour income (Abio et al., 2021).

One of the important findings of the researchers is that the ability of the working-age population to support children and the elderly is greatly influenced by the participation of women in the labor market (Hammer et al., 2015).

RESEARCH METHODOLOGY

The standard NTA methodology (NTA, 2013) was applied to calculate the Moldova NTA (2019). Main aspects related to the age profile creation were taken into account, with the use of demographical, microeconomic and macroeconomic data. Household Budget Survey (HBS) data for 2019 served to calculate the age profiles of incomes, consumption, current transfers and incomes from the redistribution of assets per capita. The Labor Force Survey (LFS) data for the same year was also used to compare labor income profiles calculated based on the HBS.

The 2019 data from the System of National Accounts (SNA) for 2019 were used to build NTA at the aggregate level (aggregated transfer accounts). Macroeconomic data show the volume of public and private consumption, labor income, income from self-employment, public and private current transfers, flows of asset-based reallocations. Data from the Ministry of Finance, the State Tax Service and the National Bank (balance of payments) were also taken into account. The NTA macro controllers served to balance the per capita age profiles with the aggregated age profiles.

The economic life cycle outcome, which is a measure of the age level of economic dependence, was defined as the difference between consumption and labor income (Mason et al., 2005). Children, like the elderly, have an economic life cycle deficit (+), i.e. average consumption during these periods exceeds average labor income. The economic life cycle surplus (-) is observed in the population of working age, when labor income exceeds consumption. The result of the life cycle allows to measure and analyze the degree of economic dependence of the population throughout life, including by gender.

To study the gender profile of income and consumption, NTAs for men and women were built based on the standard NTA approach, with age profiles were estimated based on HBS data not only by age, but also by gender. Public consumption of education services is estimated using enrollment rates by age, level and gender.

The age profiles of consumption and labor income are adjusted so that the combined value of consumption and labor income balances with the value obtained from the SNA for 2019.

The gender gap in economic dependency is measured as the absolute difference in NTA dependency ratios for both sexes, calculated as follows (Istenič et al., 2018):

$$\Delta NTA\_DRFf/m = \frac{(LCDf - LCDm)}{YL}$$

where LCDf and LCDm represent the *economic* life cycle deficit (+) for women and men, respectively. The indicator shows the additional share of total labor income needed to finance women's economic dependency compared to the total labor income needed to finance men's economic dependency.

Research limits

NTA requires spending at the individual level, while the main data source – Households Budget Survey - provides data on spending at the household level. The allocation of expenditure at the household level to the relevant individuals required standard reallocation rules, econometric approaches and, in some cases, expert assumptions.

An important limitation in assessing the income of the population of Moldova is the likely underestimation of income of the population due to the refusal to indicate the amount of wages/income in the HBS, so the results of estimating labor income by age profile may be distorted, as well as estimates of the economic life cycle deficit.

MAIN RESULTS

According to the NTA of Moldova, in 2019 the economic life cycle deficit (LCD) reached 67.6 billion MDL, the dependency ratio exceeded 59.1% (the ratio between the size of the LCD and global labor income). Women account for more than two thirds of the LCD (69.2%) (Table 1). The LCD for women records 40.1% of total labor income and for men - 18.2%, respectively, the gender gap in the economic dependence is high - 22.7%. At the same time, the total consumption of women is higher than that of men by 3.1 p.p. (53.1%), significant differences are observed in the consumption of public expenditures in the health care category (64.9%), as well as private expenditures 64.2%, which reflects the peculiarities of the structure of the Moldovan population and a significant excess of the proportion of women in the old age group. Coverage of the LCD is financed from various sources: public and private transfers, and property income.

Table 1.

Main indicators of labor income, consumption and LCD of men and women, NTA Moldova-2019, billion MDL

	Total	Women	Men	Women/men ratio in %
Lifecycle Deficit	67.6	46.8	20.8	69,2
Consumption	181.9	96.6	85.3	53,1
Public Consumption	32.0	17.5	14.5	54,6
Public Consumption, Education	9.6	4.7	4.9	48,9
Public Consumption, Health	8.5	5.5	3.0	64,9
Public Consumption, Other than health and education	13.8	7.2	6.6	52,2
Private Consumption	149.9	79.1	70.8	52,8
Private Consumption, Education	1.0	0.4	0.6	44,7
Private Consumption, Health	4.6	3.0	1.7	64,2
Private Consumption, Other than health and education	144.2	75.7	68.6	52,5
Less: Labor Income	114.3	49.8	64.5	43,5
Earnings	96.9	43.2	53.7	44,6
Self-employment Labor Income	17.4	6.6	10.8	37,9

Source: author`s calculations.

The ratio of labor income and consumption among men and women determines the formation of the LCD (Fig. 1 and 2). Thus, for men, the level of labor income exceeds consumption between the ages of 24 and 51 (27 years), while for women, expenditures exceed consumption throughout the entire life

cycle, indicating their economic dependence. Thus, the surplus of the economic life cycle in Moldova is formed entirely by men. This situation is typical for a number of European countries, including economically-developed ones, and the differences are determined by the proportion of women employed part-time, retirement age, etc. The contribution of women to the formation of a surplus in the economic life cycle is the highest in Slovenia, Denmark, Sweden and Hungary. In Cyprus, Greece, Romania, Italy, Slovakia and the United Kingdom, surpluses are also almost entirely generated by men (Hammer et al, 2015)

Figure 1.

Age distribution of income and consumption of men, NTA -2019

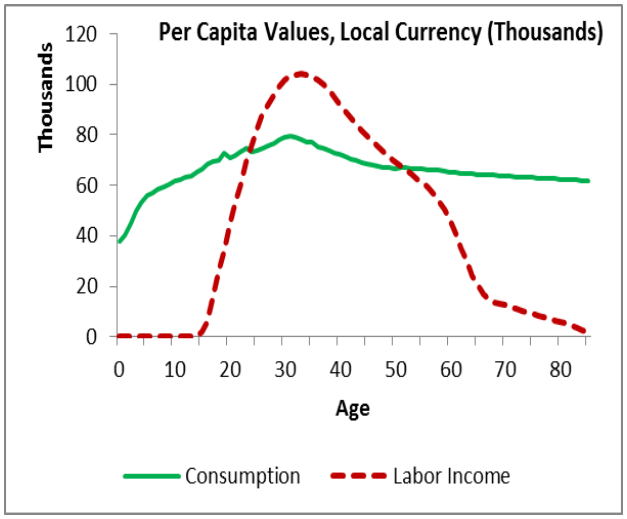
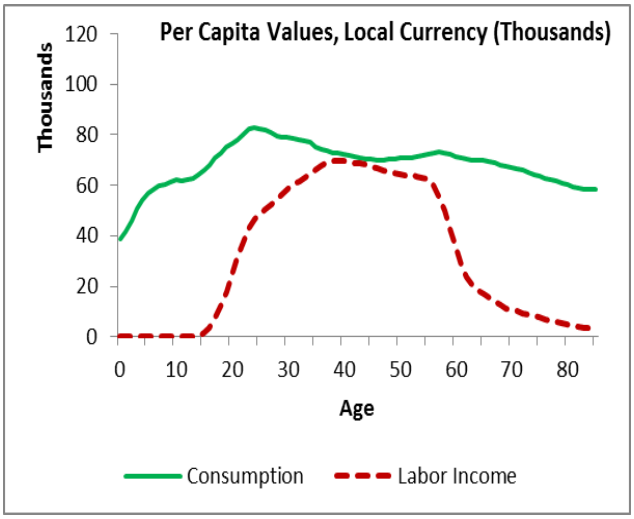


Figure 2.

Age distribution of income and consumption of women, NTA-2019



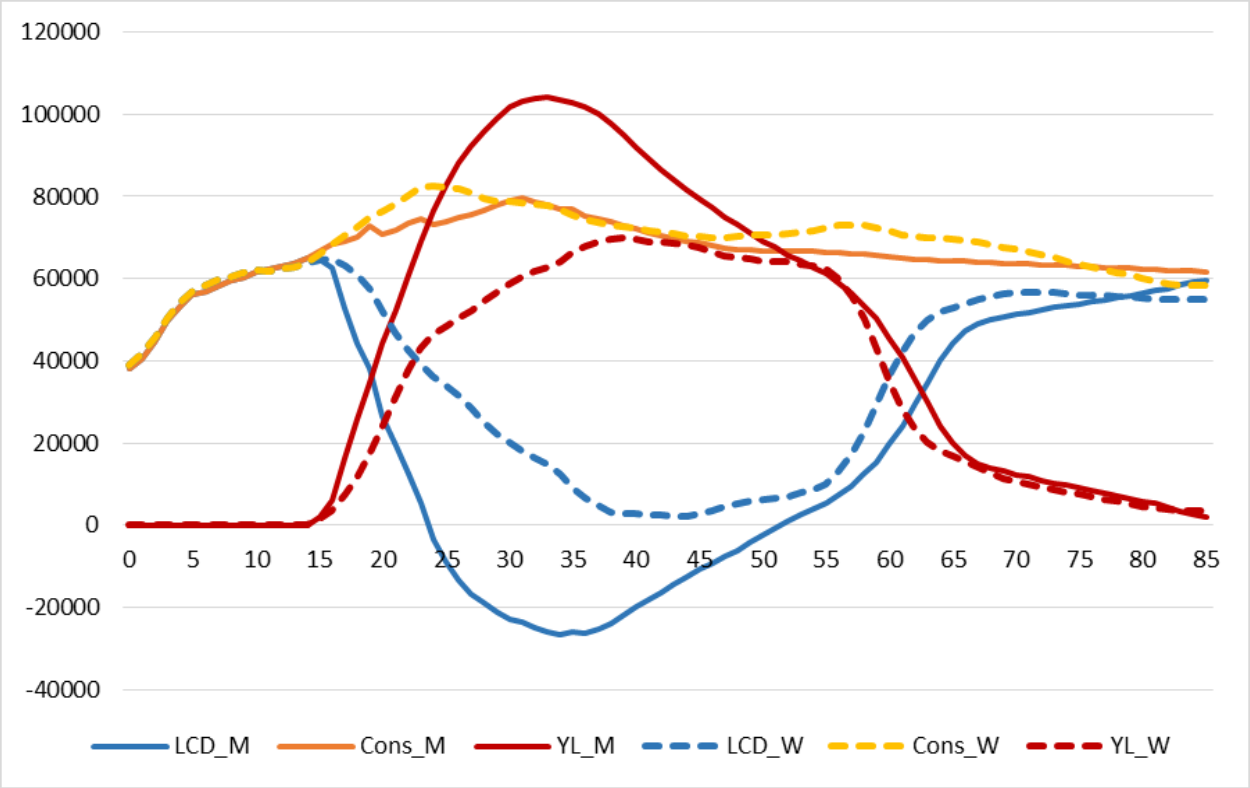
Source: author`s calculations.

In the NTA, the earned income shows its average market value at each age/age group and reflects employment rates, including full-time or part-time employment, depending on age. Thus, the difference in labor income between men and women shows a different level of participation in the labor force, different labor income, consisting of *wages of employees (including social contributions and additional benefits at a certain age*) as well as income from self-employment.

According to NTA-2019, women's nominal per capita labor income was 70.5% of that of men, and wage income was 73.4%. Gender differences in the age profile of working income are determined by the later entering of women in the labor market, the much higher enrollment rates in tertiary education and low participation in the labor market during the period associated with the birth and upbringing of children (up to 35 years of age, the labor income of women is almost twice lower than that of men). Thus, in the most active working age (up to 50 years), the level of labor income of women is significantly lower than that of men. Only starting from the age of 50, the size of the labor incomes of men and women converge, then again decrease due to earlier retirement (Fig. 3). It should be noted that, in general, the average per capita income of both men and women is very low. Thus, for men, the highest rates at young ages are a little more than 100 thousand MDL per year (about 5,000 euros), and for women they barely reach 70 thousand MDL (about 3,500 euros).

Figure 3.

Men`s and women`s annual labor income, consumption and life cycle deficit, per capita, MDL.



Note: LCD_M – life cycle deficit men, LCD_W – life cycle deficit women;
Cons_M – consumption men, Cons_W – consumption women;
YL_M – labor income men; YL_W – labor income women.
Source: author`s calculations.

It should be noted that the profile of labor income for men and women is different. For men, the curve is shifted to the left (toward younger ages), and the maximum per capita income falls on the age of 30-37 years. Perhaps this is due to the fact that the population of young ages is more represented in sectors with higher wages (IT, trade, services, etc.), while the population of older ages is more heavily employed in agriculture, where, traditionally, wages are much lower. It should be noted that such a profile is typical for some CIS countries (for example, Russia) and developing countries (Денисенко, Козлов, 2019). In economically developed countries of Europe such as Austria, France, Germany, Italy, the distribution of labor income has a profile shifted to the right, towards more mature ages, while the maximum income from employment falls on the pre-retirement age, when people reach a high position in the professional sphere and receive higher wages (Hammer et al, 2015).

For women, the labor income curve has a more uniform profile with some shift to the right. The period of highest labor income (per capita) is between 35 and 55 years of age, reflecting the higher employment rate of women in the formal economy.

Income from self-employment makes up a small share of total labor income for both men and women. Thus, for men, the annual rate per capita is 16.7% of the total labor income per capita, and for women - 13.3%. However, income from self-employment for men (per capita) is almost twice as

high as for women in the most active working ages, while for women it increases in post-retirement ages, when a small pension forces self-employment to earn a living,

The age profile of public consumption per capita for men and women differs at certain age intervals. For women, the excess is observed at young ages associated with childbearing (18-40 years), mainly due to child allowances and social assistance, and for men at retirement age due to higher pensions compared to women (Fig.4 and 5). Attention should be paid to the relatively low level of public transfers, other cash, (inflows) for women, reflecting benefits for childbearing and raising children. Thus, the highest value is observed for the point corresponding to 30 years - 13.4 thousand MDL per year per capita (about 600 euros). The aggregate indicator of public transfers, other cash, (inflows) for women aged 30-40 is 43.9% of the total consumption of this age group.

Figure 4.

Public transfers, inflows, men

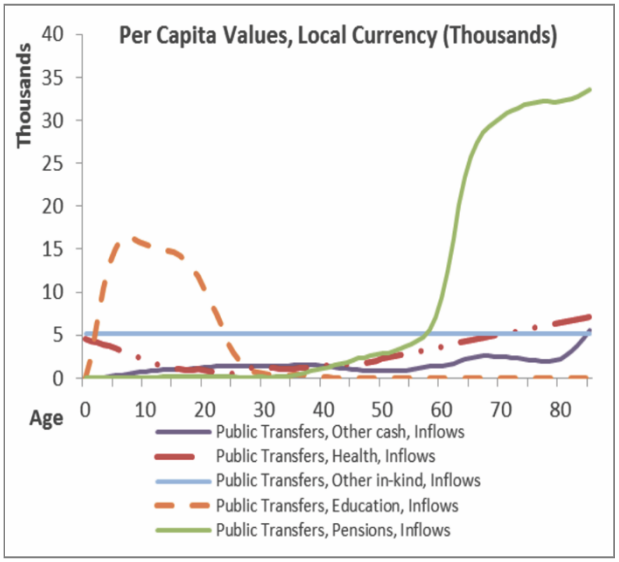
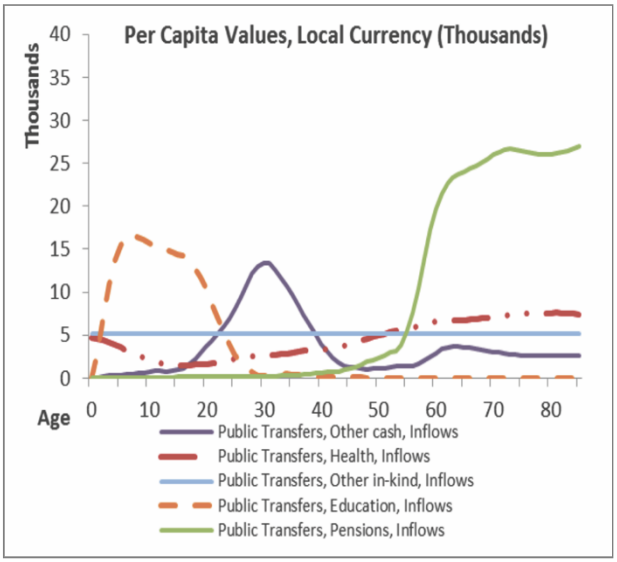


Figure 5.

Public transfers, inflows, women



Source: author`s calculations.

Gender differences are also observed in the amount of net public transfers in terms of the duration of their receipt by older people. In 2019, women became net beneficiaries of transfers at age 58 and 6 months, and men at age 63. The total amount of old-age pension contributions is significantly lower for men, due to fewer years spent as pension recipients in old age. In Moldova, there is a significant gender gap in life expectancy between men and women, which determines life expectancy in retirement. For women, life expectancy at age 58 is over 20 years, and for men at age 63, about 13 years[4]. Thus, women are net beneficiaries of government transfers than men for about 7 years more. However, annual retirement benefits for women are significantly lower than for men due to lower pensions, and per capita public transfers are higher for men.

The volume of public current transfers to education for men and women (per capita) does not differ, while transfers to health care (consumption of services) differ significantly both per capita and in aggregate. The volume of consumption of public services in health care (aggregate indicator) for women (6.0 billion MDL) is almost twice as much as for men (3.1 billion MDL), which is due both to the

[4] *Life table. Centre for Demografic Research, 2019.*

structure of the population (the predominance of the number of women, especially in older ages) and consumption characteristics. For women, the per capita lifetime consumption of health care services is about twice as high as for men starting at the age of 15 (Fig.6 and 7).

Figure 6.

Public consumption, health, aggregate nominal, by gender, MDL

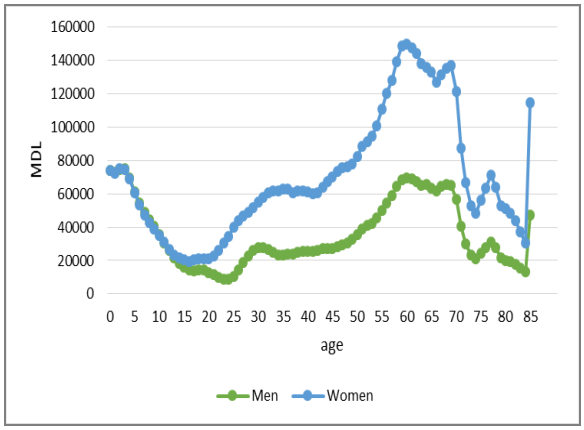
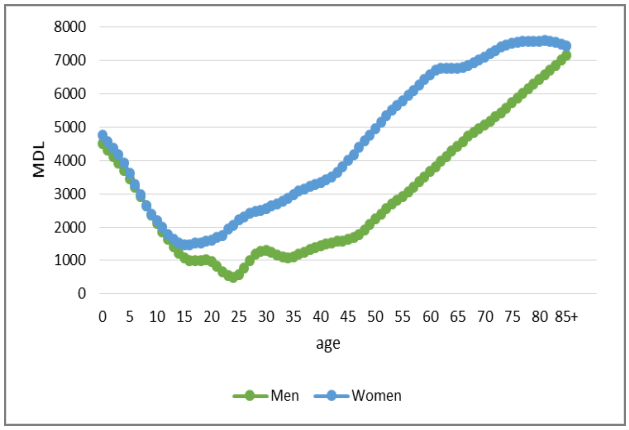


Figure 7.

Public consumption, health, per capita, nominal, by gender, MDL



Source: author`s calculations.

In terms of private current transfers, they cover a large part of the LCD, both men and women, but there are some differences. The women`s contribution in private transfers (outflows) in the most active working ages is more than twice below that of men who are the main donors of private transfers, especially those aged 25 to 55 (Fig. 8 and 9).

Figure 8.

Intrahousehold transfers (outflows), men

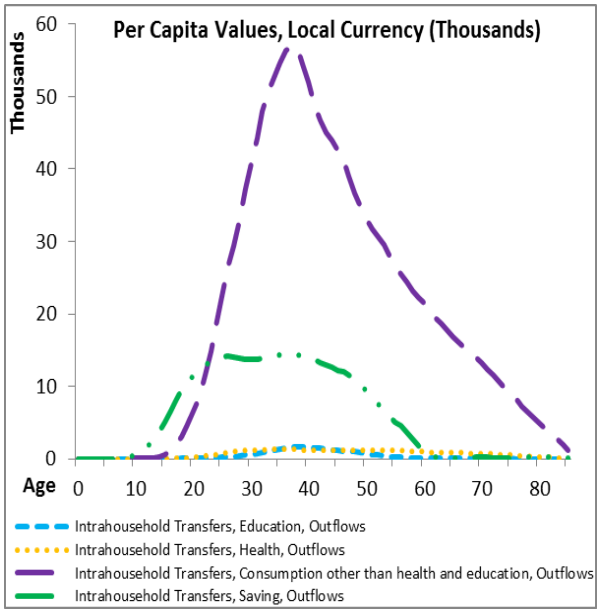
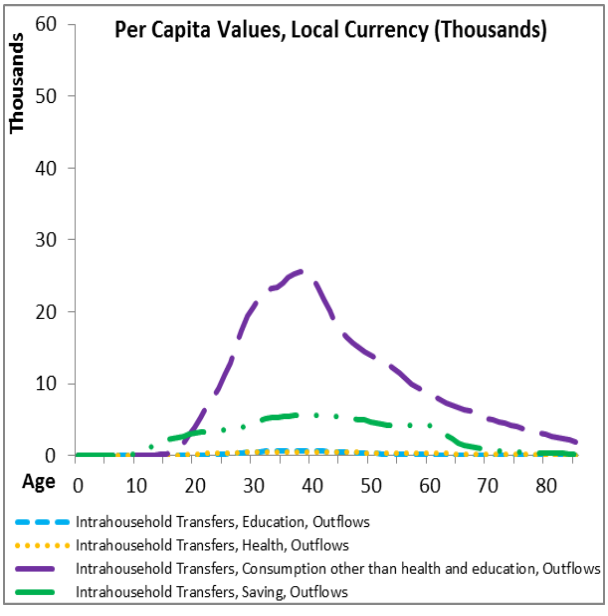


Figure 9.

Intrahousehold transfers (outflows), women



Source: author`s calculations.

Gender differences in transfers within the household (inflows) are manifested in the fact that at a young age, women receive higher transfers (other than health and education) compared to men for a longer period. Thus, at the age of 18, the volume of transfers received by women per capita is 17% higher than by men, and at the age of 30 it is more than three times higher. Women also receive higher savings returns (Fig.10 and 11).

Figure 10.

Intrahousehold transfers (inflows), men

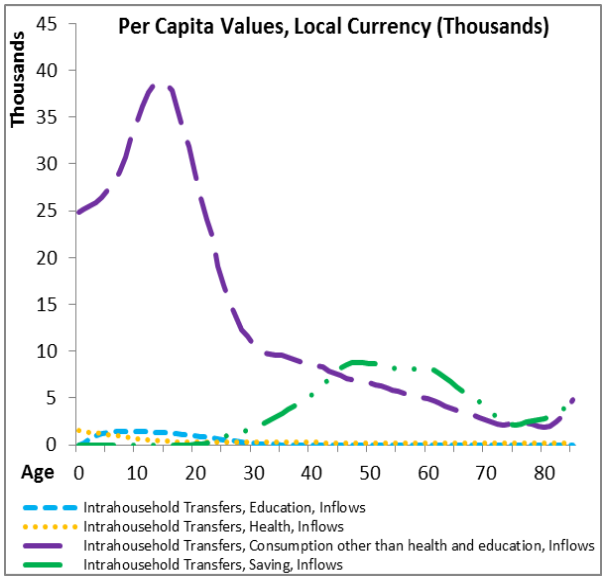
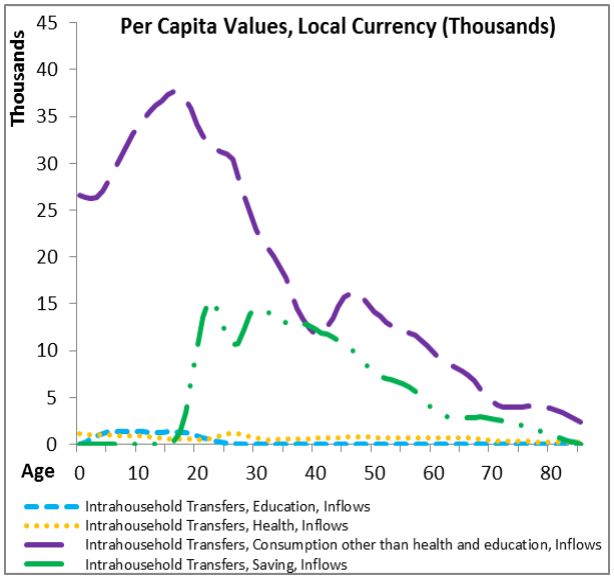


Figure 11.

Intrahousehold transfers (inflows), women



Source: author`s calculations.

The percentage distribution of consumption flows for men and women by age groups (*Table 2*) shows that for men, labor incomes cover 75.8% of consumption, while for women this is a little more than half (51.5%). Since this indicator is calculated based on aggregated data, it also reflects the features of the age structure, in particular, a higher proportion of women in older ages.

The gender profile of percentage consumption flows by age groups shows that there are no significant differences for the youngest (0-19 years old) and the oldest (65+). To the greatest extent, the differences are typical for the age group of 20-34 years old, associated with the reproductive function of women. During this period, labor income covers only 65.5% of their consumption, another 39.4% falls on private transfers. The role of public transfers in covering women's consumption during this period is low, moreover, this indicator has a minus sign (-5.1%), meaning that women's contribution to the formation of public funds (outflows) is higher than their consumption (inflow). In the 35-59 age group, the share of labor income in covering women's consumption rises to 88.8%, the share of private transfers decreases to 13.7%, and the share of income from the private asset's redistribution increases (10.4%), while public transfers with a minus sign more than double the previous age group.

For men in age groups 20-34 and 35-59, labor income exceeds consumption, that is, a surplus of financial resources is formed, which are distributed to other members of households. Thus, private transfers act with a minus sign, amounting to 28.8% and 35.5%, respectively. In these age intervals,

the share of redistribution of private assets in relation to consumption increases for men, respectively 43.9% and 54.2%.

At pre-retirement ages (60-64 years), the share of labor income in relation to consumption decreases to 55.2% for men, and to 35.9% for women due to the earlier retirement age. Public transfers (pensions) in relation to consumption are 30.5% for women and 10.1% for men. The share from the private asset's reallocation decreases to 33.8% for men, while for women, on the contrary, it increases to 25%, more than twice as compared with the previous age group. This is due to the high proportion of widows at these ages who become heads of households and, according to the NTA methodology, these incomes are assigned to them.

Table 2.

Flows as a percent of consumption at each age range, % from aggregate values

Age groups	All ages	0-19	20-34	35-59	60-64	65+
MEN						
Labor Income	75.6	6.3	115.9	111.3	55.2	18.8
Private Transfers	-7.7	53.0	-28.8	-35.5	2.4	1.5
Public Transfers	-6.6	22.3	-29.1	-28.1	10.1	47.3
Public Asset-based Reallocations	-1.6	-0.8	-1.9	-2.0	-1.5	-1.2
Private Asset-based Reallocations	40.3	19.3	43.9	54.2	33.8	33.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
WOMEN						
Labor Income	51.5	3.1	65.5	88.8	35.9	15.0
Private Transfers	26.8	56.9	39.4	13.7	9.6	9.4
Public Transfers	8.8	23.1	-5.1	-11.4	30.5	45.8
Public Asset-based Reallocations	-1.2	-0.8	-1.4	-1.4	-1.1	-1.0
Private Asset-based Reallocations	14.1	17.7	1.6	10.4	25.0	30.7
Total	100	100	100	100	100	100

Source: *author`s calculations.*

CONCLUSIONS

Age profiles of labor income and consumption of men and women were analyzed by using the National Transfer Accounts (NTA) for Moldova (2019). The age distribution of labor income and consumption made it possible to show gender differences in the formation of a life cycle deficit, that is, a period when men or women earn more than they consume. The results showed that there is a large gap in labor income between men and women throughout the life cycle, while the gap in consumption is negligible at all ages except during childbearing years, when women account for significantly more of both public and private consumption. Low labor incomes at working age and higher consumption during childbearing make women economically dependent throughout their lives.

The contribution of men to the formation of public funds compared to the contributions of women is higher in working age, due to the large difference in labor income. Because of higher employment and higher incomes, men contribute more to public funds and finance most of the consumption needs of children.

The shortfall in the women's economic life cycle is financed mainly by private transfers, which underscores and perhaps exacerbates women's economic subordination and financial dependence. The low level of participation in the labor market, especially of women with children under the age of 6, as well as low social transfers compensating the costs associated with the birth and upbringing of children, may hinder the realization of the reproductive intentions of families. In the context of a declining birth rate and an acute demographic crisis (Gagauz et al. 2021), increasing the role of the state in supporting families with children seems to be one of the important areas of social policy.

Note that this study focuses only on the market economy (unpaid domestic work is not included), while in all countries women perform (much) more unpaid domestic work than men (). Time use data for Moldova (from which unpaid work could be calculated and converted to monetary units) are only available for 2012, so it is not possible to analyze the gender gap, including unpaid domestic work. Accounting for unpaid domestic work in measuring the gender dependency gap remains a challenge for future research.

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FERTILITY TRANSITION FROM TRADITIONAL TO MODERN MODEL IN MOLDOVA: EXPLORATION IN BASE ON THE "GENERATION AND GENDER SURVEY"

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ABSTRACT

In Moldova, like in other countries of Eastern Europe, after the 1990s, fertility transition from the traditional model to the modern one is occurring. A stable fertility decline was observed up to 2004, while the total fertility rate settled at 1.7-1.8 births per woman in the following years. Although the indicator is higher compared to other states, the factors determining this level and the likely future trends are essential questions to be asked. We assume some of the sociodemographic characteristics of women, the socioeconomic and cultural context impact the reproductive behavior and determine whether to keep the traditional model or switch to the modern one. The research is conducted to highlight the differences in women's reproductive behavior and the sociodemographic characteristics that impact the number of children born.

The research is based on the" Generations and Gender Survey" conducted in Moldova in 2020. A detailed profile of women's reproductive behaviour was presented on the base of four identified clusters, which characterize the fertility transition from the traditional to the modern model. Findings reveal that the traditional model of reproductive behavior with a large family or, at most, with two children is prevalent. Medium and high education, late age at marriage and urban residence of women have a negative effect on the number of children ever born. The study quantifies the heterogeneity of reproductive behavior and has important implications for the scientific perception of current trends and prospective fertility dynamics in Moldova.

Keywords: *fertility transition, reproductive behavior, traditional fertility model, modern fertility model, Moldova*

În Moldova, ca și în alte țări din Europa de Est, după anii 1990 are loc tranziția fertilității de la modelul tradițional la cel modern. Scăderea stabilă a fertilităţii a fost observată până în 2004, în anii următori rata totală de fertilitate s-a stabilit la un nivel de 1,7-1,8 naşteri pe femeie. Deși acest indicator este mai înalt în comparație cu alte state, factorii care determină acest nivel și tendințele viitoare posibilele prezintă o întrebare de cercetare importantă. Presupunem că caracteristicile sociodemografice ale femeilor, particularitățile contextului socioeconomic și cultural au un impact asupra comportamentului reproductiv și determină fie păstrarea modelului tradițional, fie trecerea la cel modern. Pentru a răspunde la aceste întrebări, a fost realizată o cercetare pentru a evidenția diferențele în comportamentul reproductiv al femeilor, precum și caracteristicile sociodemografice care influențează numărul de copii născuți vreodată (mediul de reședință urban sau rural, nivelul de educație, vârsta la primul contact sexual, vârsta la prima căsătorie, vârsta la prima naștere, lungimea intervalelor protogenezic și intergenezic).

Lucrarea se bazează pe cercetarea ”Generațiile și Gender” realizat în Moldova în anul 2020. Pe baza a patru grupuri identificate a fost prezentat un profil detaliat al comportamentului reproductiv al femeilor, care caracterizează tranziția fertilității de la modelul tradițional la modelul modern. Constatările arată că în Moldova modelul tradițional al comportamentului reproductiv predomină fie cu o familie numeroasă, fie cu cel mult doi copii. Nivelul mediu și înalt de educație, vârsta târzie la căsătorie și reședința în mediul urban ale femeilor au un efect negativ semnificativ asupra numărului de copii născuți. Studiul cuantifică eterogenitatea comportamentului reproductiv și are implicații importante în percepția științifică a tendințelor actuale și a dinamicii prospective a fertilității în Moldova.

Cuvinte cheie: *tranziția fertilității, comportamentului reproductiv, model tradițional al fertilității, model modern al fertilității, Moldova.*

После 1990-х годов В Молдове, как и в других странах Восточной Европы, происходит переход рождаемости от традиционной модели к современной. Устойчивое снижение рождаемости наблюдалось вплоть до 2004 г., а в последующие годы суммарный коэффициент рождаемости установился на уровне 1,7-1,8 рождений на одну женщину. Несмотря на то, что этот показатель выше, чем в других странах, вопрос о факторах, определяющих этот уровень и о возможных будущих тенденциях представляет особую важность. Мы предполагаем, что социально-демографические характеристики женщин, особенности социально-экономического и культурного контекста влияют на репродуктивное поведение и определяют либо сохранение традиционной модели, либо переход к современной. Чтобы ответить на эти вопросы, было проведено исследование, направленное на выявление различий в репродуктивном поведении женщин, а также социально-демографических характеристик, влияющих на число рожденных детей (проживание в городской или сельской местности, уровень образования, возраст начала половой жизни, возраст вступления в брак, возраст при рождении первого ребенка, длина протогенетического и интергенетического интервалов).

Работа основана на данных исследования «Поколения и гендер», проведенного в Молдове в 2020 г. На основе четырех выявленных кластеров был представлен подробный профиль репродуктивного поведения женщин, характеризующий переход рождаемости от традиционной модели к современной. Результаты показывают, что в Молдове преобладает традиционная модель репродуктивного поведения либо с многодетной семьей, либо максимум с двумя детьми. Среднее и высшее образование, поздний возраст вступления в брак и проживание в городе эти характеристики женщин оказывают отрицательное влияние на число рожденных детей. Исследование дает количественную оценку неоднородности репродуктивного поведения и имеет важное значение для научного восприятия текущих тенденций и перспективной динамики рождаемости в Молдове.

Ключевые слова: *переход рождаемости, репродуктивное поведение, традиционная модель рождаемости, современная модель рождаемости, Молдова.*

JEL Classification: *J13, J29, J33.*
UDC: *614:612.6(478)*

INTRODUCTION

In Moldova, as in other countries in the Eastern European region, the modification of reproductive behavior models occurred very quickly after the 1990s, influenced by the socioeconomic, cultural and ideational transformations that took place after the breakup of the USSR and the achievement of independence. The specific characteristics of the second demographic transition, such as the postponement of births to older ages and the increase in the mean age of the first birth, became more pronounced, confirming the hypothesis regarding the convergence in fertility dynamics (Sobotka, 2017), while the persistence of the national specificity demonstrates the complex nature of this process.

Trends in fertility postponement are well documented in Central and Eastern Europe. However, Moldova was often omitted from comparative studies due to the low reliability of the population statistics or the low interest in the small European country. However, the case of Moldova is unique if we consider the territorial location bordering the EU and the high territorial mobility of the population.
The fertility postponement in Moldova follows the general pattern characteristics for most countries that have completed or are in the process of fertility transition (Frejka, 2012). At the current stage, Moldova is going through the second phase of the transition, which is highlighted by the continuous

decrease in fertility among younger women and its increase at older ages (Gagauz, Grigoraș, 2017). Compared to other ex-Soviet countries in the European region (Russia, Ukraine, Belarus and the Baltic States), Moldova's fertility transition proceeds slower. The age profile of fertility has an intermediate character of the transition from the early model to the late one (Grigoraș, 2019). Births delayed to older ages partially recover, causing the fertility of young cohorts to decline. However, the fertility level in Moldova is higher than in other European countries due to the higher birth intensity of rural women and their high share in the total population (Gagauz et al., 2021). The fertility transition, which is also associated with total fertility rates declining, unfolds differently within distinct social groups of women, with some adopting modern reproductive behavior more quickly while others still follow the traditional pattern. No studies address this issue, and the current paper aims to fill this gap.

The article presents the specific reproductive behavior of Moldovan women in the fertility transition from the traditional to the modern model. Their characteristics such as place of residence, education, age of onset of sexual activity, age at first marriage, age at first birth, and length of the protogenetic and intergenetic intervals are analyzed. Considering the complexity and versatility of the fertility transition, we applied a holistic approach using cluster analysis to generalize this process and obtain a limited number of significant types of reproductive behavior.

The paper is organized as follows: first, a brief description of Moldova's socioeconomic situation and cultural context is provided. Then the theoretical framework and the analysis of the previous studies that constitute methodological support for exploring the fertility transition in ex-socialist countries are presented. Data and the method for developing the typology of women's reproductive behavior are presented. In the subsection related to the presentation of the empirical results, the four clusters of women are analyzed, which characterize the transition process from the traditional to the modern model. Some research limitations are mentioned.

SOCIOECONOMIC, CULTURAL AND INSTITUTIONAL CONTEXT OF FERTILITY TRANSITION

After gaining independence in 1991, Moldova faced a long-lasting socioeconomic crisis, which significantly affected the population's living standards and increased the risk of poverty. Despite multiple reforms over three decades, it has failed to achieve significant socioeconomic progress and ensure a decent standard of living for the country's population. In 2021, the GDP per capita was USD 3753.9, or USD 15637 in purchasing power parity, two times lower than in Romania and three and a half times lower than in Germany. Moldova is one of the poorest countries in Europe, with every fourth household living below the poverty line (poverty headcount ratio at national poverty lines). The number of children in the family is a predictor of exposure to poverty, with over 40% of all families with three children having incomes below the poverty line (NBS, 2021).

A low level of urbanization (42.3% at the beginning of 2022) determines the population's lifestyle. Socioeconomic, cultural and demographic disparities between the urban and rural areas significantly impact population reproduction in Moldova. In the urban environment, the level of education and the employment rate of the population, including women, is higher. Families in the urban environment often face problems combining professional and family roles, which presents a constraining factor for the realization of reproductive intentions (Chistruga-Sînchevici, 2021). In rural areas, families with children have little access to extra-familial education services and limited employment opportunities, affecting human capital development.

The low level of employment, especially in rural areas, determines the high share of uninsured beneficiaries of maternity and childcare benefits and has a negative impact on the financial situation of families after the birth of a child. Of the total number of single benefit beneficiaries for the birth of

a child in 2020, about two-thirds were uninsured people, and of the beneficiaries of monthly allowances - about 45%. The ratio between the monthly allowance and the subsistence minimum (2020) for insured persons was approximately 104.6%, while the uninsured being 82.9% (NBS, 2020).

The reproductive behavior of Moldovan women is associated with the relatively low rate of contraceptive use. According to GGS data, more than half of married or cohabiting women (55.1%) use contraceptive methods, including 42.2% using modern methods of contraception. The financial inaccessibility of modern methods of contraception and the low level of public awareness are the main reasons for their low prevalence. Oral hormonal contraception is used by a small proportion of women (5%), the intrauterine device (10%) and the condom (21%) being more common (Gagauz, 2022). Unmet need in contraception constitutes 21% for women who are married or in union (Koops, 2022). Abortion remains one of the methods of birth control within the family. Despite a reduction, the abortion rate is relatively high (29 per 100 live births in 2021).

The family occupies a superior position in the lives of individuals, regardless of their demographic characteristics: age, sex, ethnicity, social status, and level of education. The ideal number of children in the family is much more than two. According to the GGS study, over half of respondents (52.6% of men and 57.5% of women) support the idea that the ideal number of children is three and more, and 44.0% of men and 40.2 % of women consider the ideal number of children to be two (Gagauz, 2022). The role of women in society can be characterized as modern in the public sphere and predominantly traditional in the private sphere, with women returning to the leading role in raising and educating children and performing household tasks (Kellum, 2020; Gagauz & Chivaciuc, 2021).

Moldova is a multi-ethnic country, with the largest share of the total population belonging to Moldovans/Romanians (80.6%), Slavic ethnic groups - Ukrainians, Russians and Bulgarians (12.4%), Gagauz people (Turkic people) present 4.5%, other ethnic groups account for 2.5%. Over 90% of the population declare themselves Orthodox (NBS, 2017).

The synergistic impact of all economic, social, institutional and cultural factors determines the specific peculiarities of the fertility transition from the traditional to the modern model in Moldova, while the differences between social groups within society, the prevalence of some or other reproductive behaviors present an indispensable component of this process.

THEORETICAL FRAMEWORK OF RESEARCH

The theoretical framework of the research constituted the theory of the second demographic transition (Lesthaeghe, van de Kaa, 1986) which assumes a complex adaptation of the entire demographic behavior model to a changing lifestyle, which, as a rule, results not only in a change of the age-specific fertility rates but also in fertility decrease, especially at the initial stage of the transition (Zaharov, 2012).

More than two decades after the emergence of the second demographic transition theory, regional differences in the fertility transition are found to be determined by deep-rooted cultural traits and patterns of social organization over time, as well as by much older systems of kinship and family organization specific to each country (Lesthaeghe, 2014). The fertility transition experience of different regions and countries shows an extensive array of combinations of second demographic transition features and timing profiles, this heterogeneity being equally contingent on historical path dependency and diverging contemporary socioeconomic and cultural evolutions (Lesthaeghe, 2020).

Given that in the countries of Central and Eastern Europe, the demographic changes associated with the second demographic transition began in the 90s period of the last century, there is a significant lag in the dynamics of fertility indicators compared to Western countries where fertility transition has

ended or is at its final stage. Some national peculiarities leave an imprint on this process. It is predicted that eastern European countries "are likely to experience further increases in pre-marital cohabitation and in the accompanying feature of higher fertility outside wedlock. However, diversity in degrees of cultural acceptance will result in persistent regional differences as well" (Lesthaeghe, 2020).

In addition to the second demographic transition theory, the research is also based on the Theory of Conjunctural Action (Johnson-Hanks et al, 2017), which emphasizes the role of the social context in which the individual interacts. Demographic events are interpreted as "social facts", the results of social action that occurred under the impact of the social structure and context. Demographic contexts involve social factors that very the fertility level of different groups of women. Although modeled as synchronic structures, conjunctures are in constant flux (Johnson-Hanks, 2007). Thus, reproductive behavior is not an abstract one, it is influenced by several specific factors such as the woman's level of education, employment, access to family planning services, the existence of a partner, the benefits of childcare leave at the time, etc. For example, women who were enrolled in the educational system for a longer time and then devoted themselves to professional careers when they were ready to start a family and give birth to a child did not find the right partner. This while women with a low level of education and limited access to family planning services faced an unplanned birth although they wanted to control their fertility. Employment or housing conditions, divorce or the death of the partner also present some life conjunctures with an impact on fertility as many other events, the overlapping of which can cause the decline or increase of fertility.

Unlike the theory of the second demographic transition, which explains the fertility transition through macrosocial changes, the Theory of Conjunctural Action draws attention to the role of life circumstances (conjuncture), which influence individuals' decisions regarding childbirth. Therefore, it comes with explanations of fertility differences at the meso- and micro levels. Although certain scientific records regarding the impact of the vital conjuncture on the distinct reproductive behavior are not presented in this paper, we do not omit its implications at the individual and general level.

LITERATURE REVIEW

Several comparative studies have concluded that although there is convergence in terms of the trajectory and structure of fertility transformation in the transition from the traditional to the modern model, the tempo of fertility is a primary factor for diversity (Billari, 2017; Matysiak et al., 2021). For the countries of Central and Eastern Europe, this region is forecast to converge with cohort fertility levels of around 1.75-2 children per woman, the proportion of women who have not given birth to any children during their reproductive life of 10-20 %, as well as emphasizing the model of families with two children (Zeman et al. 2018).

Among the essential sociodemographic characteristics of the population that influence the fertility transition, higher or lower fertility levels, is the ratio between the urban and rural population (Kulu, 2014) and the population's education (Brzozowska, 2015). In the urban area, the fertility transition starts earlier, the fertility level is lower and more intense in the late ages, and the postponement of first births is determined by the transition from traditional to modern reproductive behavior model (Kulu, 2013; Buelens, 2021). Among women with a high level of education, the traditional type of reproductive behavior is not widespread (Бурлуцкая &Терещенко, 2018).

Unlike Western European countries, in Central and Eastern Europe the association between the level of education and the probability of having children of ranks higher than one is negative. The transition to the second/third birth appears as negative for Hungary, Russia, Ukraine (Sobotka, 2017). In Romania, women with higher education try to make up for the postponement of their first birth by having at least one child by the age of 30, but in most cases, they limit their offspring to only one

child. Thus, a persistent negative effect of the higher level of education on the probability of having a second child is observed (Mureșan, 2010).

Recent studies demonstrate that differences in the intensity and tempo of fertility are observed not only between regions and countries, but also at the subnational level. Spatial variations of fertility timing in European regions and how they have changed in the last three decades confirm that there is no clear relationship between fertility intensity and the average age at motherhood, significant spatial variations are found, including within countries. Also, postponement transition was not equal in onset and speed within countries (Buelens, 2021). According to data for Slovakia for the last three decades after the collapse of the socialist state (Šprocha et al., 2022), it turns out that economic factors are identified as important for explaining spatial differences in fertility rate, along with some cultural factors that determine changes in fertility tempo.

The current study complements the empirical studies on the particularities of the fertility transition in Eastern European countries using GGS data from Moldova. Based on the identified clusters, specific characteristics of the types of reproductive behavior associated with the traditional or modern model are presented.

RESEARCH DATA AND METHODS

The research is based on the "Generations and Gender" Survey conducted in Moldova in 2020. The nationally representative sample included 10 036 respondents aged between 15 and 79 from 153 localities (GGS, 2020). Given that the age at first marriage and at first birth are the main indicators of the fertility postponement and, therefore of the fertility transition from the traditional model to the modern one (Sobotka, 2008; Brzozowska, 2021) they were selected as criteria for clustering.

The sub-sample consisted of women aged 20-49 who had given birth to at least one child (N=2079). The respondents who mentioned the month and year of first marriage registration and the month and year of the first birth were selected (N=1546). Cases with errors were excluded. Women who are currently in their first partnership and have given birth to at least one child were added to this number (N=85). Thus, the sub-sample consisted of women aged 20-49 who registered their first marriage or are in their first partnership and gave birth to at least one child (N= 1631).

The typology development technique was based on hierarchical cluster analysis by the Ward method (Elmer, 1999). Four types of reproductive behavior were identified, being analyzed as separate subsamples through the lens of the main sociodemographic characteristics of women. Statistical procedures available in SPSS, such as descriptive analysis and frequencies according to different sociodemographic variables, were used. The attributes of clusters/models of reproductive behavior in relation to the others were analyzed. To identify the most suitable model several clustering tests were performed.

The early age of marriage, of the first partnership, and of the first childbirth were considered characteristics for the traditional model of reproductive behavior. The childbearing postponement was viewed as a feature of the modern model. Thus, to highlight the clusters, four sets of age at first birth and first marriage/first partnership combination were identified (Table 1). The traditional model of reproductive behavior assumes that the first marriage occurs by age 22, and the birth of the first child – by the age of 23. Women who met these criteria were divided into two types of reproductive behavior. The first was considered "traditional with a large family" which included women who gave birth to three or more children, and the second was "traditional with at most two children". The modern type of reproductive behavior was divided into "transitional to modern" and "modern", differentiated by the calendar of births and marriages. Thus, the "transitional to modern" type implies the first marriage between the ages of 22 and 23 and the first birth between the ages of 22 and 24. In

contrast, the "modern" type is associated with the first marriage at 24 and over and first birth at 25 and over. The selection criteria values correspond to the observed trends in the age structure of women at marriage and childbearing.

Table 1.

Criteria for clustering by the type of reproductive behavior (N= 1631)

Nr.	Types of reproductive behavior	Age at first marriage	Age at first birth	Number of observations
1.	Traditional with large family	Up to age 22 de ani	Up to age 23 de ani	342
2.	Traditional with at most two children			574
3.	Transitive to modern	ages 22-23	ages 22-24	495
4.	Modern	24 +	25+	220
Total				**1631**

The descriptive statistics in Table 2 show the percentage distribution of women by cluster and according to marital status (at the time of the interview), age group, education level and area of residence. A small number of women declared cohabiting relationships, which limited the possibilities of analyzing this variable. Only in the fourth cluster (modern) does the number of cases present a higher proportion (21%), while in the first three, their share is insignificant (less than 5%). Given that living together with a partner is a precursor to marriage in Moldova and does not replace legal marriage, a low proportion of married women indicated the experience of partnership within the GGS.

Table 2.

Cluster's descriptive statistics

Clusters	Married (number)	In partnership (number)	Age groups, %			Education[5],%			Residence, %	
			20-29	30-39	40-49	Low level	Medium level	High level	Rural	Urban
Traditional with numerous family	330	12	11,3	22,4	26,2	33	21,3	9,1	23,3	7,2
Traditional with at most two children	558	16	53,2	26,3	38,4	39,9	42,1	20,3	43,9	33
Transitive to modern	484	11	33,0	36,1	23,9	19,2	28,2	50,3	29,7	47,3
Modern	174	46	2,4	15,2	11,5	7,9	8,5	20,3	3,1	12,5
Total	**1546**	**85**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[5] *The low level of education, according to the classification given by the National Bureau of Statistics, involves at most secondary education; the medium level- at least secondary/high school education and at most college education, and the higher level - at least higher education (cycle I).*

Each cluster was analyzed separately in terms of women's sociodemographic characteristics such as the area of residence, level of education, the mean age of sexual relations onset, the mean age at first marriage/partnership, the mean age at first birth, the length of proto- and intergenic intervals.

Table 3.

Statistical tests to compare the differences between the key clusters' characteristics

Independent variables (predictors)	Dependent variable – Cluster "Traditional with numerous family" = 0 Cluster "Modern" = 1			Dependent variable – Cluster "Traditional with at most two children" = 0 Cluster "Transitive to modern" = 1		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Education level (higher education)	.934	.000	2.545	.856	.000	2.354
Place of residence (urban)	1.609	.000	4.998	.429	.012	1.536
Protogenetic interval	.334	.076	1.396	.990	.000	2.692
Age of first sexual intercourse	.795	.001	2.214	.362	.013	1.436
Constant	-4.419	.000	.012	-4.768	.000	.008
Observations number	374			840		
Nagelker R Square	.378			.273		

A series of binomial logistic regressions were performed to test the statistical significance of the socio-demographic characteristics of women with different types of reproductive behavior identified. For this purpose, the models were compared: the "traditional with large family" and the "modern" type. The logistic regression model was statistically significant, $\chi 2(4) = 118.354$, $p < .0005$, and explained 37.8% (Nagelkerke R2) of the variance in predictor variability of reproductive behavior. The four independent variables registered a significant statistical difference: the place of residence, the level of education, the protogenetic interval, and the age of first sexual intercourse (Table 3).

Comparing the models "traditional with at most two children" and "transitive to modern", demonstrated that the logistic regression is statistically significant, $\chi 2(4) = 191.137$, $p < .0005$. The model explained 27.3% (Nagelkerke R2) of the variance in predictor variability of reproductive behavior. Statistically significant differences were recorded for the four independent variables (predictors).

It should be noted that the traditional model with at most two children also included women from rural areas, who gave birth to their first child at younger ages, until 22 years old (at the moment of the study). By the end of the reproductive period, they may give birth to more than two children and engage in the traditional model with a large family. Given the fact that the share of these women is insignificant in the total number of women in the cluster (40 cases, 6.9%) they were not excluded from the cluster.

Age is a key indicator that determines the probability of having children and their number. Even with the same characteristics, such as the place of residence or education level, the likelihood of having children/achieving reproductive intentions is higher for women aged 35-49. For this reason, female reproductive behavior is analyzed in general for women aged 20-49 and by separate age groups to provide a detailed typology's description.

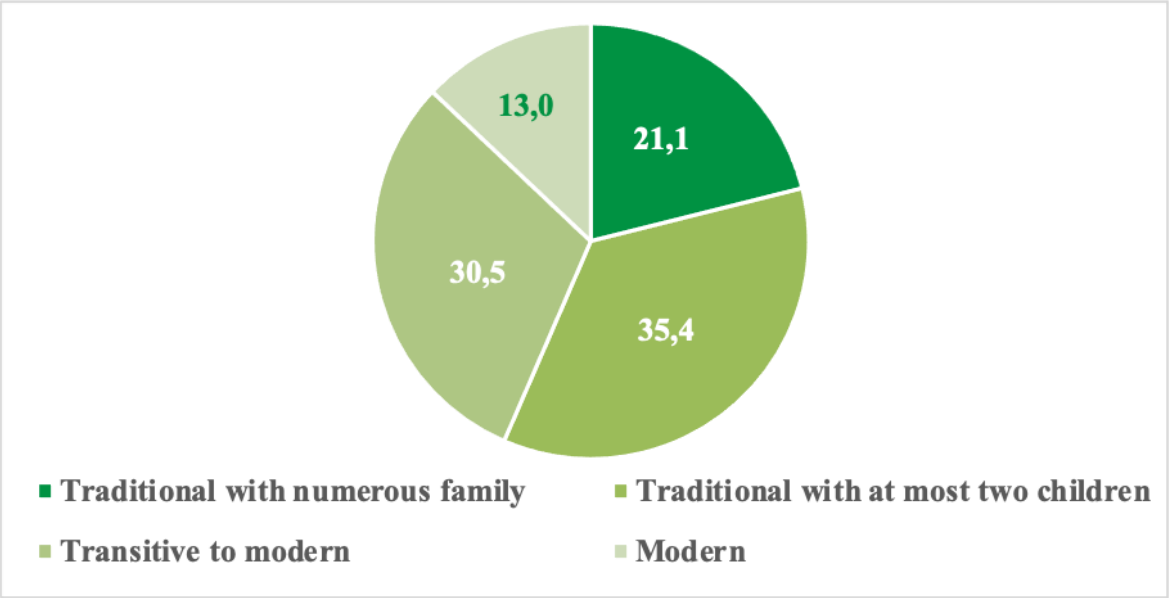
MAIN RESULTS

The four clusters of women that differ in characteristics of reproductive behavior according to the weight in the total selected sample are presented as follows: the first cluster, "the traditional model with a large family," comprised 21.1% of women; the second cluster, "the traditional model with at most two children" turned out to be the most numerous (35.4%); the third "transitional to modern" cluster, was also quite considerable (30.5%); while the "modern model", smallest by size included 13% of women *(Figure 1)*.

Figure 1.

Typology of Moldovan women's reproductive behavior models, in %

Source: developed by authors based on Generations and Gender data, 2020



Type I "traditional with numerous family".

This type of reproductive behavior is more specific to rural women (80%) with a medium and low level of education, respectively, 48.8% and 40.6%. The average number of children born during reproductive life is 3.4 children per woman.

The first births occur early, the average age of the mother at the first birth being 19.8 years, and the early onset of sexual relations before the age of 18 is characteristic for about 40% of the respondents, while between the ages of 18 and 23 it amounts to 60%. Often, marriage occurs because of an unplanned pregnancy and the protogenetic interval (the period between marriage and the first birth) less than 9 months is recorded for 59.7% of women. The birth of subsequent children occurs in short succession - "one after another", the median interval between the first and second birth being 3.1 years.

In the cluster of the traditional type with a large family, women aged 35-49 make up 64.5%, while those aged 25-34 - 35.4%.

Type II – "traditional with at most two children".

As in the previous cluster, marriage and the birth of the first child occur at young ages, but rigorous control over subsequent births is observed, with most women giving birth to at most two children (75.4%). The average number of children born is 1.87 per woman.

The average age at first marriage is 19.7, and the average age at first birth is 20.3. The model stands out by recording the greater distance between the first and the second birth (the median age is 4.02). About 47.9% of respondents record protogenetic intervals of up to 9 months, 42.1% – more than nine months to 2 years and 10% – more than two years. For these women, the onset of sexual relations towards the age of majority is characteristic. Those who started sexual relationships between 18 and 23 years record 65.8%, while towards the early ages of up to 18 years 34.3% of the respondents, and only 6.5% towards the age of 24 and above. Like the "traditional with a large family" model, the "traditional with at most two children" is more specific to women from villages (71% of the total number of women in this cluster). Most respondents have secondary education - 57%, low-level education - 29% and only 10% - higher education.

Within this cluster, women aged 35-49 constituted 51.3%, those in the active reproductive period - ages 25-34 (34.2%), and ages 20-24 (14.5%).

Type III, "transitive to modern".

Compared to previous clusters, marriage at older ages and more rigorous birth control takes emphasis, which causes women to have fewer children on average. Women marry around 23-25 years (average age at first marriage – 23.4) and give birth to their first child on average at age 24, recording a more extended period of married life without children. Sexual relations start even later, after age 19. The "transitive to modern" model includes women with two children in a proportion of 60.6%, one child - 30.9%, and three children or more - 7.9%. The average number of children born per woman is 1.8. There is more stringent control over first births, as evidenced by a longer protogenetic interval. For 39.9% of the respondents, this is from ten months to two years. At the same time, 37.2% of women record the protogenetic interval of even more than two years. Successive births occur at longer intervals, with at least 4.2 years between the first and second births. For women who have also given birth to their third child, the intergenetic interval of 5 years is recorded.

Compared to the previous models, there is a higher proportion of women with higher education in this cluster. Thus, women with secondary education make up 44%, and those with higher education - 39.9%. More than half of the women (53.7%) are from cities. About half of the respondents of this cluster are those aged 25-34 (51.6%), 35-49 years old record 48.3%, and the youngest respondents aged 20-24 number 1.4%.

Type IV, "modern"

it is characterized by marriage at older ages and the late birth of the first child. More women in this cluster have one child - 45.4%, two children - 41.4%, while 13.2% have three children and more. The onset of sexual relations occurs later compared to the first three types of reproductive behavior, the average age being 20. There was a higher share of respondents who were initiated into sexual relations between the ages of 18 and 23 (69.2%) and 17.4% at age 24 and over. Early onset up to age 17 is characteristic for only 13.4% of women in this cluster. Entry into the first partnership occurs at the age of 23+. Specific to this cluster is the high share of women who gave birth to their first child out of wedlock (17.1%). The average age at first marriage is 28.7, and 29.3 for a first birth. The average protogenetic interval is 1.2 years; pregnancy before marriage (protogenetic interval up to 9 months) is characteristic for 43% of women, more than 9 months to 2 years – 39.1% and more than two years – 18%. The average interval between the first and second birth is four years. Most women have higher

education - 44.8% and secondary education - 44%. Compared to the "transitive to modern" model and the other models, the proportion of urban women in the "modern" cluster is higher - 60.9%. Women aged 35-49 are found in a ratio of 73.6%, those aged 25-34 – 26.4%.

On base of clustering criteria, the respondents were assigned to previously highlighted types according to age group and place of residence (Table 4). The results demonstrate a proportional presence of women who fall into the traditional type of reproductive behavior either with a large family or with at most two children in the age groups 20-34 and 35-49, which constitute more than half of the total number of women. Among women who have realized their reproductive intentions (35-49 years), 27.2% referred to the "transitive to modern model" and 14.9% to the modern one. Young women (ages 20-34) register a higher proportion of those who fall into the "transitive to modern" model (36.5%), while only 6.7% belong to the "modern" model.

The clustering of women by place of residence once again underlines the fact that the "traditional type with a large family" has lost its position in the urban area, while the "transitional to modern" and "modern" ones prevail, constituting about 60%. It is remarkable that in the rural area, the "traditional with at most two children" type is present in the highest proportion (43.9%).

Table 4.

Results of clustering by women's age groups and place of residence, in %

Nr.	Types of reproductive behavior	Age groups		Residence	
		20-34	35-49	Rural	Urban
1.	Traditional with large family	17.1	24.7	23.3	7.2
2.	Traditional with at most two children	39.7	33.2	43.9	33.0
3.	Transitive to modern	36.5	27.2	29.7	47.3
4.	Modern	6.7	14.9	3.1	12.5
Total (%)		**100**	**100**	**100**	**100**

DISCUSSION AND CONCLUSIONS

The typology of reproductive behavior models demonstrates some particularities of the fertility transition from the traditional to the modern type in Moldova. The main factors influencing fertility transition are the place of residence and the education level of women. The persistence of traditional model, either with a large family or with the limitation of at most two children, was found both among the older (ages 35-49) and the younger generations (ages 20-34), especially in rural areas and among women with a low level of education. Traditionally, the fertility of rural women is higher than that of urban women, being determined by the lifestyle and the lower level of education of rural residents. The preservation of cultural traditions, higher social control of reproductive behavior, and reduced opportunities to modernize living conditions make the fertility transition from the early to the late model slower.

Identified patterns show that changes in reproductive behavior appear in postponing marriage and the first birth to older ages (tempo effect), causing a decrease in the number of children of higher

ranks and an increase in the proportion of families with a small number of children (quantum effect). Having children at young ages leads to a more significant number of children born during the reproductive period, while postponing births leads to a decrease in the number of children born. This finding correlates with other research (Sobotka, 2018).

The recording of the long time gap between the registration of marriage and the birth of the first child specific to the "modern" model of reproductive behavior elucidates the rational choice of the moment of childbirth and the control of fertility characteristic of women with a higher level of education. At the same time, a higher share of women who declared themselves in partnership relations confirms the hypothesis regarding the diversity of family models in the second demographic transition and the increase in the share of children born out of wedlock (Lesthaeghe, 2020).

Considering the slow pace of socioeconomic modernization in Moldova, the high level of migration of the population, especially the young and well-educated ones, the high level of poverty, as well as the uncertainty regarding the future, we assume that the fertility transition will stagnate or unfold at a slow pace, the total fertility rate will remain at the level of 1.7-1.8 children per woman. At the same time, the gap in fertility indicators between Moldova and other ex-Soviet countries in the European region, where the fertility transition started after the 90s of the last century, may increase.

Our study has some limitations. We analyzed fertility histories of women between 20 and 49, born in different periods. Their reproductive activity started in the later 1980s - the beginning of the 1990s. The older generations' reproductive behavior was impacted by families' policies implemented in the Soviet Union; those who were in the most active reproductive ages in the late 1900s and early 2000s faced a severe socioeconomic crisis that could negatively affect the number of children born. Reproductive behavior of the youngest generations is more affected by cultural and value changes. Thus, they were exposed to different historical, structural, and cultural contexts that may have influenced reproductive behavior. In addition, various circumstances that determine individual histories of childbearing, marriage and partnership, whether it is an unplanned pregnancy, separation from a partner, or divorce, also had a particular impact on women's reproductive behavior and the number of children born.

Another limitation of our study refers to the use of retrospective data. Although we can expect that the vast majority of respondents correctly reconstruct fertility histories, we cannot rule out the possibility of misreporting.

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EDUCATIONAL IMMIGRATION TO MOLDOVA: OPPORTUNITIES AND CHALLENGES FOR PARTICIPATION IN THE INTERNATIONAL MARKET OF EDUCATIONAL SERVICES

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ABSTRACT

The mass emigration of the youth from Moldova, including educational emigration, usually without a subsequent return home, has negatively impacted the demographic situation and the number of students in Moldova's higher education institutions. The internalization of the higher education system allows Moldova to actively involve itself in educational migration to attract international students to Moldova's universities and use academic immigration as investment potential for developing higher education institutions. The article displays the results of an investigation related to attracting international students to Moldova's higher education institutions. The work is based on the analysis of national legislation in education and migration fields. The results of qualitative research were carried out in 2022 by interviewing specialists of higher education institutions responsible for the work with international students. The study aims to find out opportunities to increase the universities' potential in attracting international students, possibilities and main impediments in this process. The results show that to attract international students to Moldovan universities, it is necessary to determine the institutions or facilities y that could be attractive for international students. A systematic approach to the development and promotion of educational migration should be adopted, considering the specifics of the countries in the region and the possibility of amending the migration legislation.

***Keywords**: international educational migration, higher education, foreign students, export of educational services*

Emigrarea masivă a tinerilor, inclusiv plecarea lor la studii peste hotare, ca regulă fără revenire în patrie, a avut impact negativ asupra pieței muncii, dar și asupra numărul studenților în instituțiile de învățământ superior din țară. Internaționalizarea sistemului de învățământ superior permite Moldovei să se implice mai activ în migrația internațională în scop de studii, pentru atragerea studenților străini în instituțiile de învățământ superior din Moldova, folosirea imigrării în scop de studii ca un potențial investițional în dezvoltarea universităților. În articolul dat se prezintă rezultatele cercetării privind situația ce ține de atragerea studenților străini în instituțiile superioare de învățământ din Moldova. La baza cercetării au stat analiza legislației în domeniul educației și legislației imigraționale, precum și rezultatele unei cercetări calitative efectuate în 2022 prin intervievarea personalului responsabil de lucrul cu studenții străini din cadrul instituțiilor de învățământ superior. Scopul cercetării consta în determinarea oportunități creșterii potențialului instituțiilor superioare de învățământ în atragerea studenților străini, posibilitățile existente și impedimentele principale în procesul dat. Rezultatele cercetării au arătat, că pentru atragerea studenților străini în instituțiile superioare de învățământ din Moldova este necesară indicarea concretă a instituțiilor/facultăților ce prezintă interes prioritar pentru studenții străini, elaborarea unei abordări sistemice în elaborarea și promovarea imigrării străinilor în scop de studii, ținând cont de specificul țării lor de origine, precum și posibilitatea modificării legislației migraționale.

***Cuvinte cheie.** Migrația internațională în scop de studii, învățământ superior, studenți străini, export de servicii educaționale*

Массовая эмиграция молодежи Молдовы, в том числе выезд на учебу в другие страны, как правило, без последующего возвращения на родину, оказала негативное влияние как на демографическую ситуацию в целом, так и на численность студентов молдавских вузов. В данной статье представлены результаты исследования ситуации по привлечению иностранных студентов в вузы Молдовы. Работа основывается на анализе национального законодательства в области образования и миграции, а также результатов качественного исследования, проведенного в 2022 г. путем интервьюирования специалистов вузов, ответственных за работу

с иностранными студентами. Цель исследования − определить возможности увеличения потенциала университетов в привлечении иностранных студентов и основные препятствия для данного процесса. Результаты исследования показали, что для привлечения иностранных студентов в вузы Молдовы необходимо четко определить более приоритетные вузы/факультеты, представляющие интерес для иностранных абитуриентов, выработать системный подход в разработке и продвижении образовательной иммиграции с учетом специфики стран происхождения студентов, а также рассмотреть возможность изменения миграционного законодательства.

***Ключевые слова**: международная образовательная миграция, высшее образование, иностранные студенты, экспорт образовательных услуг*

***JEL Classification:** F22, H100, I20*
***UDC:** 314.742(478)*

INTRODUCTION

Participation in the education services international market offers countries the possibility to get economic, demographic and political dividends, as the demand for the education provided in the country and its quality increases the country's image internationally. According to World Trade Organization's data, the volume of the world education market is 50-60 billion US dollars, which is controlled by countries such as the USA, UK, Austria, France, and Germany. At the same time, the number of youth interested in educational migration is also growing.

For recent decades, half of the students in the world market have come from Asian countries. China, Correa, Malaysia, India, and Hon Kong are leading countries in this sense. In the second place, there are Near Eastern Arab countries and North African countries such as Morocco, Iran, Jordan, Algeria, and Palestine. The leaders of the international education services market are the USA, earning on international students fifteen times the amount that the government earmarks for this purpose. In addition, the UK, German, French, Austrian, Canadian and Spanish higher education institutions take an active part in attracting international students. At the same time, a rise in the activity of relatively small countries as Estonia and Czechia was noticed in recent years in the market of educational services, which implement systematic policies aiming to improve the methods in attracting international students, facilitating their adaptation and integration up to their naturalization.

Consolidation of the competition for highly qualified human resources both among developed countries and rapidly emerging countries, as well as the perception of educational migration as a factor of countries' high competitiveness and increase of human capital, are global trends in today's field of migration processes (Ignatova & Gorbunova, 2020). Educational migration flows become more intense, and the question is whether the Moldovan higher education system will profit from this possibility and what role it will play in this process.

The work aims to highlight the possibilities for the participation of Moldovan higher education institutions in the international market of education services and factors contributing to this process or halting it.

RESEARCH METHODOLOGY

The study is based on legislation in higher education analysis concerning the transition of the Bologna system, immigration law, statistical and administrative data.

A qualitative study was carried out through in-depth interviews with specialists from the Ministry of Education and Research and the Ministry of Interior Bureau of Migration and Asylum (2 interviews), as well as the university's staff responsible for the work with international students (15 interviews). The study was conducted in May 2022. The main purpose is to determine the positions of universities in attracting international students and their opportunities/needs for intensifying these processes. The interview guide contained blocks of questions regarding the availability of academic staff, necessary infrastructure, the possibility of mutual recognition of diplomas, impediments to increasing the number of international students, etc.

LITERATURE REVIEW

Educational migration matters are given great attention by UK, German, and Slovenian scientists in their research (Ribeiro, 2021; Rehak, 2020; Velazquez, 2022; Osler, 2020) etc., as well as in post-Soviet countries such as the Russian Federation, Belarus, Ukraine, Kazakhstan and others (Zamotin, 2016; Varshavskaya&Chudinovskikh, 2014). Education is perceived as one of the tools of migration and integration policies (Mukomel, 2015)

Some research mentions that with the decrease of the birth rate and population ageing, it is necessary to activate the immigration policy, including the one concerning education-related immigration. To attract qualified human capital to the economy is required to improve the work on attracting foreign citizens to study with the possibility of their subsequent naturalization (Fokeeva & Rytova, 2020, Tihonova & Kormiltchik, 2017). The trans nationalization of higher education, cross-border presentation of educational programs, the influence of the global knowledge hierarchy, image and reputation of higher education institutions, non-uniform mobility of educational migration, differentiation of the value of international higher education, correlation of matters of migration, citizenship and development of education system were studied (Waters & Brooks, 2021; Velazquez & Eghert, 2022). A significant number of works are devoted to the systemic approaches in overcoming cultural and social barriers for foreign students, especially from the countries of the global south, the definition of basic criteria for their best integration (Abdulai et al., 2021).

ANALYSIS OF LEGISLATION IN EDUCATION AND MIGRATION

Since 2005 Moldova, along with 47 other countries, has been a part of the Bologna process[6]. Though with certain flaws, the reforms carried out under this process in the field of higher education allowed the country to implement the provisions of the Bologna process. The following aspects were implemented: (a) the system of comparable degrees, including the implementation of the academic transcript to ensure the employment possibility for European citizens and increase the international competitiveness of the European Higher Education; (b) the introduction of two-cycle education: undergraduate and postgraduate; (c) implementation of the European credit unit mutual recognition system to support large scale student mobility (grade system); (d) development of student mobility and increase of academic and other staff mobility; (e) contribution to the European cooperation in quality assurance aiming at developing matching criteria and methodology, interinstitutional collaboration, mobility schemes and common education programs, etc. Therefore, Moldova has a particular competitive priority in higher education compared to countries not parties to the Bologna process.

[6] *Except medical education, since the duration of the study period in medical universities has not changed.*

In 2014 the Education Code of Moldova was adopted by law No. 152 dated 07.07.2014. The code instituted an *equivalent education document, i.e.,* an education document received through the same education system either in the country or abroad. There were introduced state educational standards that established mandatory conditions for the implementation of education programs at all levels and education cycles in public and non-public education institutions, the minimum compulsory standards related to educational programs, minimal mandatory work volume for students and academic staff, to infrastructure and equipment of the institution, to the level of competence of the graduates and the organization of the education process. The state educational standards serve as the basis for an objective assessment of the education quality, level, and qualification of the graduates regardless of education form.

During subsequent reforms, an assessment of the country's higher education institutions was conducted under the methodology and criteria of the National Agency for Quality Assurance in Education and Scientific Research and approved by Government. The draft Intergovernmental Framework Agreement on recognition of diplomas, academic qualifications, skills and competencies with 23 European states, including destination countries of Moldovan emigrants, was approved. Concerned countries are Italy, France, Great Britain, Ireland, Denmark, Germany, Poland, Hungary, Sweden, Norway, Finland, Czech Republic, Slovenia, Slovakia, Bulgaria, Portugal, Greece, Turkey, Israel, Cyprus and Baltic countries. In addition to the agreements achieved on an intergovernmental level, the country's universities have the right to independently establish connections with higher institutions worldwide.

The mechanism of enrolment of foreigners in higher education institutions, the procedure of their transfer to other higher education institutions of the country as well as the legalization of foreigners' education documents were additionally regulated by a special Governmental Decision No.504 of 04.07.2017 "On Approval of the Disposition on Education of Foreigners in the Higher Education Institutions of Moldova and Annulment of some Governmental Decisions".

The reform of the higher education system, its modernization and the introduction of educational standards comparable with European ones have triggered academic mobility, participation of Moldovan higher education institutions in international programs such as Erasmus+Programme, and increased the attractiveness of the higher education institutions for international students. For instance, international students in Moldovan universities participated in the Erasmus Mundus Student Exchange Programme with universities in Turkey, Hungary, Belarus, Poland, and Germany.

The further development and functionality of the higher education system depend on the demographic factor. The decrease in the number of youth due to emigration and the birth rate decline led to a fall in the number of national students enrolling in universities. There is a constant annual average decrease of 9% compared to the previous year during 2007-2021, from 128 thousand to 59 thousand students. The country's higher education system is thus facing a double loss - a decrease in the number of national students and the failure of cultivated academic staff, having the infrastructure capable of meeting the needs of the educational process for a more significant number of people. Moldovan universities have a highly professional teaching staff: 60% of the contingent (2400 people) hold a scientific degree; 87.5% - PhD; 12.5% - are habilitated Doctors.

There is a need to use the possibilities of the Moldovan higher education institutions system to promote a systemic national policy of attracting educational immigrants. However, even with attractive conditions and the opportunity of choosing a university in a particular country, state immigration policies that facilitate the entry and stay of young students in the country are no less important for foreigners.

Immigration issues are treated ambiguously in Moldova due to the post-Soviet prohibitive law enforcement practice, the negative attitude of the population to the consequences of the 2014-2015 migration crisis in EU countries[2], the presence of a certain degree of xenophobia, the lack of a vision in the interaction between immigration processes and economic development, protection of the citizens' security, etc. The country's active involvement in the processes of globalization contributed to adopting a national legal framework for the requirements of international treaties and the EU Directives in migration, human rights, education, etc. and their transposition into national legislation.

According to the EU legislation, specific priority measures have been introduced into national legislation during the "National Action Plan for the Implementation of the Association Agreement between Moldova and the European Union for 2017-2019". *In immigration, it was proposed to define criteria for the selective and controlled admission of foreigners to the country, considering the needs of the labor market, capital, investment, etc.* Subsequently, an integrated approach made it possible to develop several policies oriented to migration opportunities aimed at development. In particular, Governmental Decision No. 200 of February 26, 2016 "On the Approval of the National Strategy "Diaspora-2025" and the Action Plan for its implementation for 2016-2018" was adopted.

Immigration to study in Moldovan universities is regulated by Law No. 200 of 16.07.2010. "On the Regime of Foreigners in Moldova" defines general rules for granting the right to temporary residence in Moldova for educational purposes to foreigners entering Moldova to study at pre-university, graduate or postgraduate level educational institutions. The law also regulates the temporary stay in the country of trainee graduates of higher education institutions from a member state of the European Union or other states.

Moldova Government Decision No. 655 of 08.09.2011 "On the Approval of the National Strategy for Migration and Asylum (2011-2020)" is significant. According to the Strategy, the Directive of the Council of Europe of 2004/114/CE of December 13, 2004, the conditions for the admission of third-country nationals for educational purposes, student exchange, unpaid vocational training or volunteer activities and others were transposed into national legislation. The strategy also set "*the promotion of higher education institutions of Moldova to attract foreigners to study. Determining the conditions under which foreigners, upon graduation, may extend the period of stay in Moldova"* as one of the goals.

International students are enrolled in educational institutions of Moldova according to the national legislation, international agreements, and international/regional projects/programs to which Moldova is a party. Agreements concluded between educational institutions accredited in the prescribed manner, as well as individual contracts concluded between foreigners and educational institutions.

The selection and enrollment of international students is performed directly by universities based on education documents from the country of origin, allowing access to the appropriate level of education (study cycle) in Moldova. Several Moldovan universities select prospective students directly in their country of origin, which ensures the quality of selection while reducing the cost of education for students. The legislation regulates the admission procedure of foreigners to the general, vocational and higher education institutions of Moldova, as well as the obligations of universities to organize a quality learning process for foreigners.

The conditions for entry and obtaining a residence permit in Moldova by international students are pretty simple. Permission for a temporary stay in Moldova is granted by the Ministry of the Interior Bureau of Migration and Asylum at the request of the educational institution (a document confirming the student's enrollment for study) with confirmation of necessary funds for education in Moldova. The national passport, proof of accommodation, medical insurance, and a certificate of no criminal

record students have to submit along with the application. The originals and copies of the civil status acts are also presented if necessary.

Foreigners entering Moldova to study in pre-university, graduate or postgraduate level institutions must open a long-term study visa to enter the country. The physical presence of the foreigner in a Moldovan consular office abroad is required for the visa obtaining, which is not always possible due to insufficient diplomatic missions abroad. According to Ministry of Foreign Affairs and European Integration data, only 33 of them, many concurrently serving several countries. Diplomatic missions are represented mainly in the countries of the European region, Canada and the USA. As for Asia, which is the most promising in terms of the possibility of attracting potential students, the opportunities for our diplomatic missions are limited. The additional time and significant travel costs required to open a study visa led to an increase in the overall cost of educational services for residents of this region, which leads to the loss of a part of the people who may become potential students of our universities. Suppose there is an interest in activating the presence of Moldova in the educational services market. In that case, it will be necessary to develop possible mechanisms to solve the issue of visa availability.

Amendments to the legislation and the possibility of visa-free movement of citizens of Moldova to the CIS and EU countries have made the country more attractive for immigration, the flow of which is increasing slowly but constantly. Between 1994 and 2019, the number of annual applications for a residence permit rose from 1543 to 4757. Applications related to admission to study at Moldovan universities increased from 515 to 625. Immigration for study at the universities of Moldova accounted for a high share in the total number of foreigners who entered. In the 1996-2000 and 2013-2018 periods, the percentage of educational immigration amounted to more than 40% and 22%, respectively, in the total immigration flow. The total number of foreigners with a residence permit in Moldova to study for the 2020/2021 academic year was 4.6 thousand and for 2021/2022 - 5.2 thousand people. Every second international student receives a medical education. According to the Bureau of Migration and Asylum by the Ministry of Internal Affairs, most of the international students are citizens of Romania (40.1%), Israel (35.6%), India (12.1%), Ukraine (2.6%), the United States (1.7 %) and Turkey (1.4%).

The attractiveness of educational immigration to Moldova is determined by the existence of universities that provide study opportunities in several popular areas (medicine, pharmacology, information technology, international economic relations, etc.) at relatively low education costs. However, the national higher education system lost the volume of exports of educational services to a number of countries whose citizens previously studied in Moldova. From 2000 to 2004, the number of students from Romania decreased nine times; from 2000 to 2006 the number of Ukrainian students fell by half, and from Syria almost four times.

Since 2009, the number of students from Israel in Moldova has increased, and since 2014 from India. Language particularities, the existence / absence of common cultural and religious traditions with the students' country of origin required more flexibility from the university academic staff in organizing the educational process in a way that would avoid wasting time required for learning the language, to ensure the best adaptation of students. Thus, the enrollment of international students from India, Israel, and Syria allows Moldovan universities, by improving the qualifications of the teaching staff, to organize the educational process in English or another language that is widely used in the region. Teaching in one of the international languages contributes to the growth of the competitiveness of the educational institution. For example, within the "N. Testemitanu State Medical and Pharmaceutical University" teaching is conducted in Romanian, Russian, English or French, in the Academy of Economic Studies of Moldova in Romanian and English, in the Independent International University of Moldova in Russian, Romanian and English, in the Comrat University, where education is conducted in Russian and Turkish.

PRIORITIES FOR ATTRACTING INTERNATIONAL STUDENTS TO MOLDOVAN HIGHER EDUCATION INSTITUTIONS. THE RESULTS OF QUALITATIVE RESEARCH

The competition for talented and highly qualified human resources is currently increasing. The intensity of educational migration is due to many factors: (a) the increasing importance of education as a result of the development of the information/digital society; (b) the need for continuous education and continuous professional development in connection with the modernization of the labor market and increasing competition in connection with this; (c) the existence of integrated educational systems that meet the regional/global needs of the economy; (d) internationalization of the educational environment, the introduction of common educational standards, etc.

Educational migration opens opportunities to preserve and develop the higher education system in Moldova. Eliminating several gaps in the higher education system and improving the conditions for foreigners' stay in the country for study purposes would contribute to the more active involvement of Moldovan universities in this process.

The rankings of universities are an essential guideline for youth in choosing their country of study, and the positions of Moldova's higher education institutions in the international classification, are far from first place. However, several other factors also influence the choice of Moldova for education, and this is not only the ranking of the university and the cost of education. Surveys conducted among international students in other countries (Pimanova &Fomina, 2019) also revealed several expectations of international students regarding the educational institution and the host country, which can be considered and used in Moldova.

Among the main factors, one can note the high education quality, diploma prestige; competence of teaching staff involved in the educational process; moderation of expenses for accommodation, food and insurance in the country; medical expenses, volume and quality of medical services provided to foreign students; knowledge of the language, level of adaptation and awareness of foreign students in the host country; attractiveness of the country for education, in our case of Moldova; the possibility to obtain a long-term visa for education (list of required documents, presence of an embassy in the country of residence, etc.); desire to get an education in a more developed country, compared with the country of residence and, if possible, employment in it after graduation; opportunity to use the acquired knowledge in their native country; existence/absence of religious and cultural traditions that give rise to certain personal risks for the student (risks for a foreigner to get involved in illegal activities in the host country).

Correlating these expectations with the possibilities of Moldova, we can determine the potential for more active participation of Moldova in the export of educational services. There are 20 public and private higher education institutions in Moldova, which have a particular experience working with international students. In the interviews, the experts noted the strengths of universities: (a) reform of university management and management under European standards and their integration into global and regional education systems; (b) strengthening contacts between higher education institutions and the labor market; (c) the presence of a network of higher education institutions capable of providing potential students with a range of specializations of interest now or in the future, such as medicine or information technology, international finance and banking, technical professions; (d) relatively low tuition fees as compared to other countries; (e) the positive and long-term experience of Moldovan universities in working with international students from the European and Asian regions; (e) availability of the necessary infrastructure for study and living; (i) relatively liberal immigration policy, etc.

According to the results of the qualitative research, all universities are interested in attracting international students on a contract basis, which can help strengthen the university's facilities. Depending on the higher education institution and the faculty to which the student is enrolled, the annual tuition fee currently varies from 1.5 to 6.0 thousand dollars, which is several times less than that of other European countries and is an attractive rate for international students.

To attract international students, most universities have created special departments responsible for providing information and attracting prospective students from foreign countries, accepting the necessary documents, assisting potential students in obtaining a residence permit, housing, etc. A potential student can also get more detailed information about the country, university, conditions of admission, and the possibility of participating in student mobility programs on universities' websites in one of the UN languages.

During the interview, a few bureaucratic barriers were also mentioned, the simplification of which would contribute to better interaction between universities and international students. In particular, the practicality of simplifying the procedure for obtaining a residence permit by including the preparatory period in the general period of the educational process was emphasized, streamlining the forms of statistical reporting, the need for a more preferential procedure for serving universities by the institution responsible for documenting foreigners, etc. Experts also noted that in Moldova, unlike many European countries, the best categories of international students are not provided with employment according to the diploma obtained.

The experts mentioned that there is no information on cases of non-recognition of Moldovan diplomas abroad since the Ministry of Education and universities do not have the practice of monitoring the employment abroad of foreign graduates of our universities according to their speciality. The absence of such data makes it impossible to objectively determine to what extent the quality of training at a Moldovan university meets the expectations and is in demand by employers in the country of origin. Therefore, it is difficult to determine the prestige of a Moldovan diploma and the possibilities of further attracting other representatives of these countries to study.

CONCLUSIONS

Depending on the priorities established at the national or higher education institutions level, the international market of educational services allows for solving demographic or economic problems, using educational immigration as a particular investment potential. The country's higher education institutions and responsible departments should consider the academic, financial and material needs for more active participation in the market of international educational services, using and supplementing the existing advantages. In particular, the following possibilities should be considered:

- *purposeful allocation of resources to strengthen universities and/or faculties/ specializations most in demand by international students in Moldova*, to modernize their educational base, provide the possibility of teaching in English, and improve living conditions for international students. It is possible to use the experience of other post-Soviet countries, such as Estonia, which brought several national universities to a high rank (21) among 1300 educational institutions in the world. It should be considered that according to the international scale of educational services, the most demanded fields among international students are currently business education (specializations related to economics, management, marketing, business information systems, etc.) - almost 25%, technical and engineering sciences, especially information technology (20 %), natural sciences, mainly mathematics (20%), social specializations (7-8%), art (5-6%) and medicine (4-5%).

- a more *selective approach related to the countries of origin of potential students* for Moldovan universities. During the survey, the experts showed that the most acceptable target group for studying in Moldova would be students from CIS countries, Syria, Turkey, Israel, India, Nepal;

- while determining a potential group of countries to attract students to Moldova, it is advisable to consider the possibilities of *more active involvement in the work of diplomatic missions*. It is also necessary to monitor how the industry develops in these countries and what technologies are being introduced; what staffing needs they have and what educational policies are pursued by national governments, etc. to develop further systematic approaches to attract students from these countries, taking into account changing needs;

- in view of the existing shortage of highly educated and highly skilled labor force in the country, consider the possibility of employment of specific categories of international students after they graduate from Moldovan universities;

- a significant source of income for the country can be the experience of using the intellectual potential of graduates of Moldovan universities who returned to their homeland. Development at the state and other levels of special programs will promote professional cooperation between universities and graduates, cooperation in advanced training, professional retraining, etc.

- considering the prospects for youth mobility in the European and Asian regions, it is advisable *to create more favorable immigration conditions for a selected group of countries*, provide for the possibility of employment in Moldova for university graduates and the recognition of educational diplomas at the bilateral level, as an advantage in attracting students from selected countries.

The experience of Moldova's universities accumulated during the 2019-2022 (Covid-19) pandemic allows expanding the range of educational services provided by Moldovan universities (language courses, distance education, schooling, advanced training, additional education) and products (various programs, methods, educational CDs, books, etc.).

The modest position of Moldova in the international market of educational services proves not so much the non-competitiveness of our higher education system as much as the lack of a formulated orientation of state policy towards promoting national educational services and optimizing efforts within the country, the lack of coordinated actions of ministries and departments.

Exporting educational services certainly brings economic benefits to both universities and the country. At the same time, entering the foreign market will tighten the requirements for the quality of the educational product, its professional conversion, the educational content and conditions for student learning. And consequently, it will improve the quality of the national education system.

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Review of the monograph "Population of the Republic of Moldova after 30 Years of Independence: Major Challenges and Policies Needed"

(Editor – Dr.hab. Olga Gagauz)

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The collective monograph "**Population of the Republic of Moldova after 30 Years of Independence: Major Challenges and Policies Needed**" is prepared by a group of Moldovan demographers from the Centre for Demographic Research of the National Institute for Economic Research (dr.hab. **Olga Gagauz**, dr. **Mariana Buciuceanu-Vrabie**, **Irina Pahomii**, **Vitalie Stirba**, **Tatiana Tabac**, **Ecaterina Grigoras**). The monograph is devoted to an exhaustive analysis of the population dynamics and the main demographic process in the light of socio-economic changes in the Republic of Moldova during the 30 years of independence.

After declaring its independence in 1991, the Republic of Moldova, like the other newly independent states, experienced numerous social, economic and political disturbances. Certainly, these changes have had a significant impact on population structure and main demographic processes such as fertility, mortality and migration. The overall negative vector of the country's demographic development is first and foremost due to mass migration of the Moldovan population, lower fertility and high mortality. The short- and long-term effects of these demographic shifts on the country's socio-economic development and national security are extremely serious and require evidence-based policies. From this standpoint, this monograph can be used as a guide for decision-makers in the process of developing and implementing public policies. One of the greatest strengths of the manuscript is the reliability of the statistical data used by the authors, including the own population estimates of the Centre for Demographic Research, which can sometimes differ significantly from officially published data. A further important feature is that the analysis is given in the context of the principal public policies of the past three decades, which makes it possible to assess their impact on demographic dynamics. Finally, the in-depth analysis of population change and its main components allowed the authors to develop different scenarios on the future dynamics of the Moldovan population and to formulate a set of practical recommendations for decision-makers.

Chapter 1 presents the main information on changes in population size and structure and raises the issue of the quality of population data. In particular, the authors provide detailed information about the data sources available for population estimates in Moldova and compare them to their own estimates. Particular attention is given to the evolution of the population in the territorial profile, which should be of particular interest to policymakers.

Chapter 2 is dedicated to the evolution of fertility in Moldova and its main determinants such as education and ethnicity. The combination of transversal and longitudinal approaches enabled the authors to depict the true picture of the fertility transition in Moldova in the European context. Further, the evolution of fertility in the country is explained very clearly through the prism of the second demographic transition. A special interest, therefore, concerns the detailed analysis of births outside marriage and the differentiation of fertility by the level of education. The authors give a critical insight into the various factors that have contributed to the decline in fertility in Moldova, from the economic crisis of the 1990s and social anomie theory to the impact of COVID-19 pandemics in 2020.

Chapter 3 focuses on the analysis of mortality and life expectancy in the country, reflecting changes in the health of the population over the past thirty years. The authors examined the contribution of changes in mortality by age and cause to the changes in life expectancy at birth over three different periods (1991-2000, 2000-2010 and 2010-2020). To better understand the differences and similarities with other post-Soviet countries, the authors provide a comparison with Estonia, where mortality was almost identical to that of Moldova immediately after the collapse of the Soviet Union. In addition, the authors competently analysed the issue of high working-age mortality from the perspective of premature mortality, including years of potential life lost, and cause-specific avoidable

mortality. Special attention was given to mortality due to COVID-19 infection and its impact on life expectancy changes in 2020.

Chapter 4 looks at the most challenging demographic issues for Moldova, namely population migration. The authors start with a very clear description of terminology and data sources on population migration. On the basis of various statistical sources, including mirror statistics of the destination countries (mainly Russia, Italy) and border crossing migration data, very valuable information on the evolution of migration flows for the study period is presented. The citizenship naturalization process in the main destination countries may be of particular interest to the reader.

Chapter 5 deals with the population projection drawn up for the period 2019-2040. It is important to stress that population projections are based on different scenarios for future trends and patterns in fertility, mortality and migration resulting from the study of long-term demographic changes. Another important feature of the presented population projection is that it refers to the concept of the usually resident population recently adopted by the national statistical office.

Chapter 6 discusses the changing social and economic conditions of the Moldovan population during the period of independence, which has a direct influence on demographic dynamics. Using representative national sociological investigations, the authors provide a detailed analysis of the social well-being of the Moldovan population, access to health services, labour force and its quality and capitalization in the local marketplace. An important conclusion concerning the poor and even declining quality of life and the increasing income inequality of the population is made.

The monograph concludes with key findings and a set of practical recommendations that are based on the concept of “demographic resilience”. The authors underline that the process of depopulation associated with a rapid population ageing in Moldova cannot be solved solely by improving the country’s economic conditions. They consider that the reduction of migration, which is a key factor of depopulation in the country, is only possible with significant improvements in all aspects of people's lives. The recommendations addressed to policymakers are directly based on the results of the authors’ study, are clearly formulated and align with contemporary theoretical and practical concepts of demography.

The monograph is distinguished by a high level of approach to the topic, accompanied by high-quality graphs, maps and tables, which contributes to an easy perception of the presented material. The authors used rich and relevant literature sources, including references to their own writings, some of which have been presented in scientific journals and conference proceedings. The monograph is written in a professional style in Romanian and is well organized. The authors express their thoughts clearly, technical terms are used, but their definition is clearly explained.
I respectfully recommend the publication of the monograph “Population of the Republic of Moldova after 30 Years of Independence: Major Challenges and Policies Needed” (Editor – Dr.hab. Olga Gagauz), and I hope that it will serve as a practical guide by decision-makers in the field of demographic policies.

Chisinau, February 2022

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