DAUGAVPILS UNIVERSITĀTE
HUMANITĀRO UN SOCIĀLO ZINĀTŅU INSTITŪTS

DAUGAVPILS UNIVERSITĀTES HUMANITĀRO UN SOCIĀLO ZINĀTŅU INSTITŪTA UN HUMANITĀRO UN SOCIĀLO ZINĀTŅU FAKULTĀTES STARPTAUTISKO ZINĀTNISKO KONFERENČU RAKSTU KRĀJUMS

19. Starptautiskās zinātniskās konferences
„Sociālās zinātnes reģionālajai attīstībai 2024”
materiāli
(2024.gada 18.-19.oktobris)
III DAĻA. EKONOMIKAS AKTUALITĀTES

PROCEEDINGS OF THE INTERNATIONAL SCIENTIFIC CONFERENCES OF THE INSTITUTE OF HUMANITIES AND SOCIAL SCIENCES AND FACULTY OF HUMANITIES AND SOCIAL SCIENCES OF DAUGAVPILS UNIVERSITY

The materials of the19-th International Scientific Conference
“*Social Sciences for Regional Development 2024”*
(18th –19th October, 2024)

PART III. ISSUES OF ECONOMICS

Apstiprināts Daugavpils Universitātes Humanitāro un Sociālo zinātņu institūta Zinātniskās padomes sēdē 2025. gada 26. martā, protokols Nr. 2.

Meņšikovs V. (zin. red.) *Daugavpils Universitātes Humanitāro un sociālo zinātņu institūta un Humanitāro un sociālo zinātņu fakultātes starptautisko zinātnisko konferenču rakstu krājums. Starptautiskās zinātniskās konferences „Sociālās zinātnes reģionālajai attīstībai 2024" materiāli. III daļa. Ekonomikas aktualitātes.* Daugavpils: Daugavpils Universitātes Akadēmiskais apgāds „Saule", 2025. 112 lpp.

Rakstu krājumā iekļauti Daugavpils Universitātes Humanitāro un sociālo zinātņu institūta un Humanitāro un sociālo zinātņu fakultātes 19. Starptautiskās zinātniskās konferences „Sociālās zinātnes reģionālajai attīstībai 2024" (2024. gada 18.-19.oktobris) materiāli: universitātes zinātnieku, doktorantu, kā arī citu Latvijas un ārzemju sadarbības augstskolu zinātnieku raksti ekonomikas nozarē. Par rakstos atspoguļotajiem faktiem, viedokļiem un terminoloģiju atbild rakstu autori.

Ir iekļauts datu bāzē: / Included in the database:
Electronic Journals Library of University of Regensburg.

ISSN 2255-8853
ISBN 978-9934-39-035-7

SATURS / CONTENTS

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FORECASTING GOVERNMENT SPENDING IN CONTEXT OF ECONOMIC DEVELOPMENT UNDER ECONOMIC UNCERTAINTY

Economic uncertainty poses significant challenges to economic development, as it becomes more difficult to predict future economic conditions, which affects aspects such as investment decisions and employment levels. In this context, forecasting public expenditure becomes particularly important. Forecasting government spending using neural networks is an important tool for managing economic uncertainty. It enables efficient resource allocation, economic stabilization, risk mitigation, investor confidence, support long-term goals, and fiscal policy flexibility. In the context of economic development, sound spending forecasting provides governments with a roadmap to effectively manage volatility and continue their journey toward growth and development. The use of neural networks for forecasting government spending is becoming increasingly important given the increasing complexity and unpredictability of the modern economy. Neural networks, a subset of machine learning, offer several advantages over traditional forecasting methods, especially in the context of government spending, which can depend on many dynamic and interrelated factors.

Key words: economic uncertainty, government spending, neural network, forecasting.

Global Uncertainty and Economic Decision-Making

Global uncertainty has become a significant factor influencing economic decision-making, especially around public spending. Factors such as geopolitical tensions, trade wars, climate change and technological disruptions have created an unstable and unpredictable environment (Ahir et al. 2023; Baker et al. 2016; Bedianashvili 2023; Bedianashvili et al. 2024; Dai Peng-Fei et al. 2021). This is clearly demonstrated by the dynamics of economic policy uncertainty (EPU) shown in the following charts, with uncertainty increasing not only in individual countries but also globally, which is reflected well in the Global Economic Policy Uncertainty Index - GEPU (Economic Policy Uncertainty n/d).

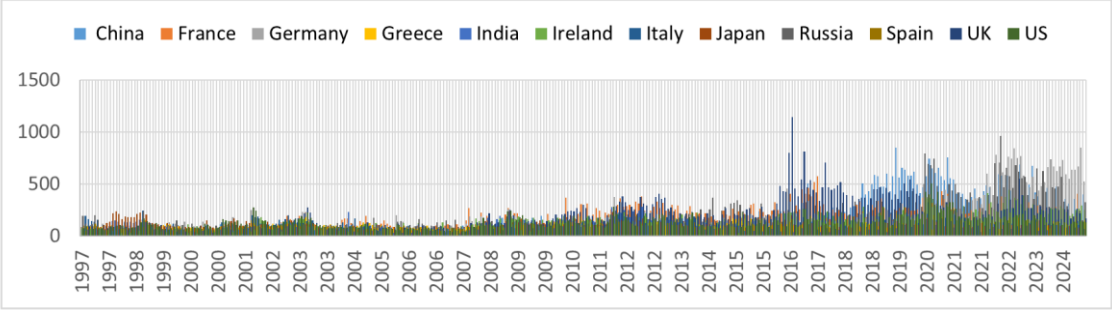

Figure 1. **EPU Indexes for 12 Countries**

Source: Authors' computations based on data of Economic Policy Uncertainty (n/d).

As can be seen from Figure 1, EPU is increasing in a number of the world's leading economies, which is especially noticeable in the last decade.

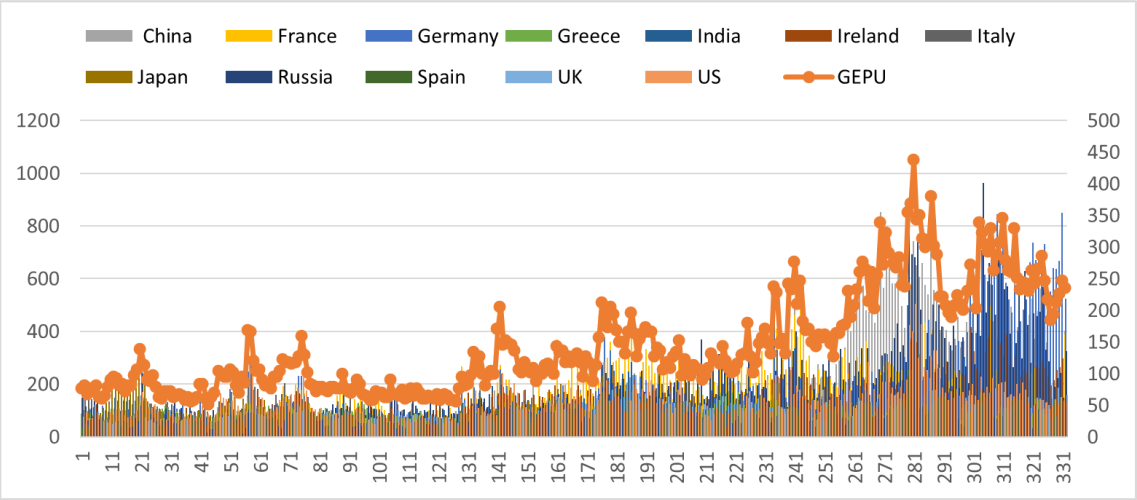

Figure 2. **EPU Indexes for 12 Countries and GEPU**

Source: Authors' computations based on data of Economic Policy Uncertainty (n/d).

It is noteworthy that in parallel with the growth of EPU within the leading large economies, the global level - GEPU - is also characterized by significant growth dynamics (Figure 2). Rising uncertainty over time – uncertainty in economic policy has been increasing over the years, especially since 2008. Large spikes correspond to significant economic and political events: after 2008 – the global financial crisis, after 2016 – Brexit, US-China trade war, after 2020 – the COVID-19 pandemic, after 2022 – the war in Ukraine (Bedianashvili 2023).

Among these challenges, we highlight some of what we believe to be the most significant:

- Rapidly changing economic landscape: The accelerating pace of technological advances, changes in consumer preferences, and geopolitical events can quickly make economic forecasts out of date. This makes it difficult to accurately forecast future public spending needs.
- Political uncertainty: Changes in government policies, such as tax reforms, trade agreements, and regulatory changes, can significantly affect government spending. Uncertainty about these policies can make it difficult to forecast spending needs.
- Unexpected shocks: External shocks, such as natural disasters, financial crises, or pandemics, can disrupt economic activity and require unplanned government spending. These events can make it difficult to accurately forecast spending needs in the short and long term.
- Long-Term Trends: Forecasting government spending also requires considering long-term trends, such as demographic changes and technological advancements. These factors can have a significant impact on government spending on areas like healthcare, education, and infrastructure.
- Data Limitations: The availability and quality of data can pose challenges in forecasting government spending. In some cases, data may be limited or unreliable, making it difficult to accurately assess economic conditions and future spending needs.

Here, neural networks can offer significant advantages in forecasting government expenditures due to their ability to (see, for example, Choubey et al. 2025; Yang et al. 2023):

- Handle complex relationships.
    - Nonlinear relationships: neural networks can model complex, nonlinear relationships between economic variables that may not be easily captured by traditional statistical methods.
    - Large data sets: Neural networks can handle large data sets, allowing them to include a wide range of economic indicators and historical data. This can improve the accuracy of forecasts.
- Adapt to changing conditions.
    - Dynamic learning: neural networks can continually learn and adapt to new data, making them more responsive to changes in economic conditions. This is important in a rapidly changing economic environment.
    - Non-stationary data: neural networks can handle non-stationary data, meaning they can account for changes in the underlying statistical properties of the data over time. This is important for forecasting government spending, since economic conditions are often subject to shifts and trends.

Forecasting Government Spending Using Neural Network

Fiscal policy is one of the keys and a crucial part of economic policy and the importance of this topic has increased significantly, which is especially evident in the recent world. Following the 2008 global financial crisis, discussions surrounding the effectiveness of fiscal policy became more prominent. Similarly, the Covid-19 pandemic underscored its critical role. On the one hand, maintaining an appropriate fiscal stance ensures the timely availability of necessary resources. On the other hand, leveraging various fiscal instruments fosters economic recovery and promotes long-term sustainability.

Fiscal policy, implemented by the Ministry of Finance, operates through adjustments to tax policies and expenditure components. Its proper implementation is crucial, particularly given the ongoing need for sound economic policy following global crises.

Fiscal policy can be either expansionary or restrictive. Expansionary fiscal policy involves increased government spending and measures to reduce income, typically to stimulate economic activity (Mikeladze, Bedianashvili 2024; Mikeladze 2023). Conversely, restrictive or tightened fiscal policy aims to increase budget revenues and reduce state expenditures to address budgetary imbalances or overheating economies.

Additionally, fiscal policy can be classified as countercyclical (or anticyclical) and procyclical. Countercyclical fiscal policy moves in the opposite direction of economic cycles, advocating for tightened policies during periods of economic growth and expansionary policies during crises and recessions. Procyclical fiscal policy, on the other hand, aligns with the economic cycle, which can exacerbate economic volatility. It should be noted that countercyclical fiscal policy is generally considered optimal, as it provides fiscal stimulus during recessions and ensures fiscal consolidation during economic booms.

Discussions on implementing a coherent fiscal policy and addressing issues related to fiscal consolidation are particularly relevant in the modern world. After periods of economic boom, stabilizing economic activity often becomes a necessity. However, an even more critical and noteworthy phase is the post-crisis period, during which fiscal consolidation is essential. This process aims to bring the fiscal deficit back within acceptable thresholds and stabilize key economic indicators.

When the government takes action, it can be the change in taxes or spending. Taxes, on one hand, can be direct and indirect taxes, which helps the government to decide which group should be taxed more. On the other hand, government spending can be divided as

current and capital spending. Therefore, it is essential to compare not only the potential effects of implementing tax and expenditure policies but also the changes in the composition of expenditures during fiscal measures. For instance, it is important to consider the differences in the use of current versus capital expenditures. Furthermore, distinctions can be made between changes in direct and indirect taxes and their potential effects on the economy, as these types of taxes serve different purposes and are paid by different groups within the population.

The focus in this analysis will be about the current spending, which is discretionary measure, and the government decides how much to spend, after considering the situation within the economy. In addition, the decision about the amount of spending also depends on the current economic stance, because the current spending is influenced by the economic cycles as well.

In order to see the impact of the government spending, first, it needs to be forecasted. Considering the fact that we are interested not only the changes of the variables in the past but also how it will behave in future, forecasting process becomes more crucial. In government spending, we focus on the current spending in Georgia, which affects different economic variables as well. At the same time, government spending is affected by the economic cycles too, because government decision how much to spend depends on the economic stance and also automatic stabilizers play their role too.

For the forecasting process of the government spending, we are using the neural networks and checking how well the more projects the variable. In addition, it will help us to see the reason of the discrepancies between the actual and forecasted figures.

The graph below shows the actual data of Georgian government spending during the period of 2006-2024. The graph shows the shock periods, which is explained by the war in Georgia during 2008, when there was also the global financial crisis, and there was a COVID-19 period starting from 2020.

As it is shown in the graph, the government spending data is quite volatile and it is interesting to see how the forecast looks like using different forecasting methods.

The government spending data is provided from 2006 January to August 2024, in millions of GEL. As the data is for monthly basis, is shows the volatility considering that spending changes depending on the part of the year. For example, in most cases spending is higher during the end of the year than during the first months. Hence, we can assume that government spending data has the seasonality, but we decided not to solve the seasonality and have not provided the seasonally adjusted data as we wanted to have the actual figures for the forecasting purposes.

As it is visible on the graphs, spending increases time by time, and during 2006-2008, monthly government spending was mainly below mln 500 GEL, while in 2024 it amounted to more than mln 1500 GEL each month. As for the recessions, there was a one-time reduction in spending during August 2008, due to the war. In addition, there was another shock due to the COVID-19 pandemic and it affected government spending as well. As a result, government spending increased in 2020 and 2021 the most, mainly through to the social contributions part.

If we use all the available data of government spending during 2006-2024, we can make the forecast for the next period and have the out-of-sample forecast, and also check whether the actual and forecasted values are different, and having the in-sample-forecast.

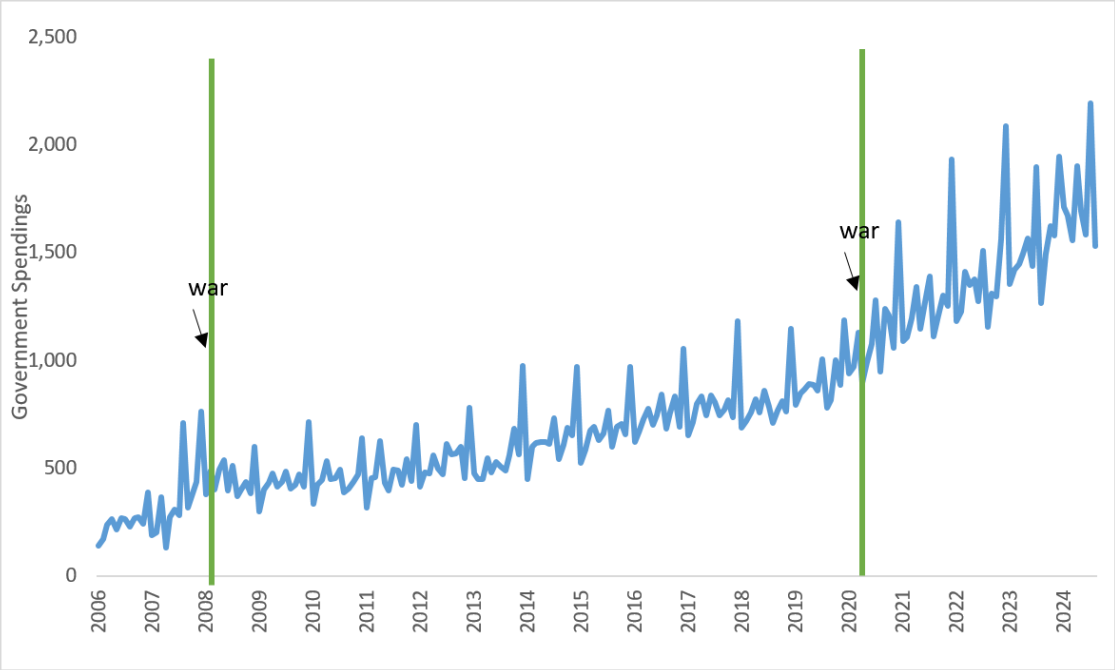

Figure 3. **Government spending of Georgia (2006-2024)**

Source: Ministry of Finance of Georgia (2024).

It should be noted that throughout the period 2006-2024, state spending in Georgia is increasing. It is noteworthy that the main factors of growth are financial crises, military conflicts, the COVID-19 pandemic, inflation and economic instability. Budgetary spending has a clear growth trend, after each major crisis the level of spending does not return to its initial level, indicating the long-term nature of the impact of these events on the state budget (Figure 3). Moreover, the complexity and difficulty of the forecasting object makes it interesting to identify appropriate forecasting methods.

Empirical Analysis

We will consider in this section the testing of evidence observed to support our thesis.

First, we discuss two primary types of forecasting we do in our study – Out-of-Sample and In-Sample.

Out-of-Sample forecasting where we make predictions using all available data without partitioning the data into different subsets. It uses every single data point, which is often a good thing if you have very few data points.

However, In-Sample forecasting requires us to split our data into a training and a test set. We build a model on a training set, then use a test set which the model has never seen, to validate its accuracy. Usually, the data is divided in 80/20 % or 90/10 % ratios. This helps us validate that our model is capable of generalizing to unseen data.

Now, we are going to share what forecasting model we used for this project. This study decided to use Meta's Data Science Team developed neural network model Prophet to implement government spending forecasting in Georgia.

Prophet was selected because it is very accurate, and it does well at capturing seasonality and other periodic trends in the data. The model can fit non-linear trends with

seasonal and holiday effects which makes it an ideal fit for economic data as it is composed of additive and multiplicative components.

Additionally, Prophet is robust to missing values, structural breaks, and outliers, making it a reliable choice for forecasting quite complex variables such as government spending.

Now, let's discuss the results. Starting with Out-of-Sample forecasting, we can see in the graph (Figure 4) that the red line represents the fitted values, the blue line represents real government spending, and the green line indicates forecasted values.

This type of forecasting proved to be reliable even during the challenging pandemic period, effectively adapting to changes caused by COVID-19.

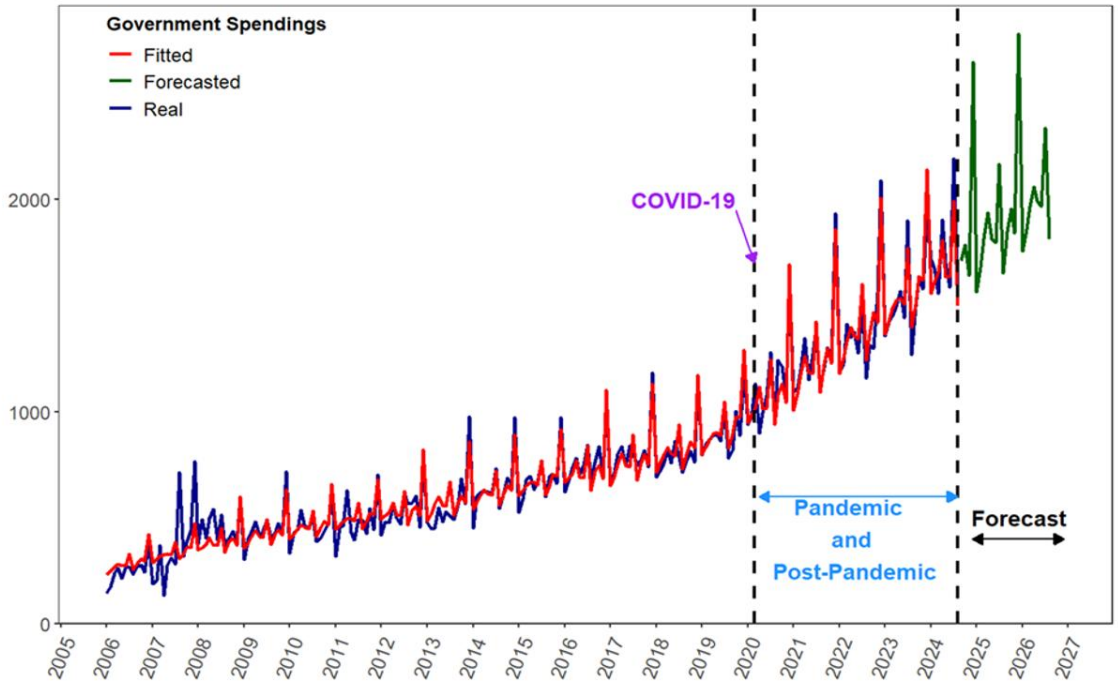

Figure 4. **Government Spendings Out-of-sample Forecast**

Source: Authors' computations based on data of Ministry of Finance of Georgia (2024).

As shown, the model continued to produce accurate forecasts into the post-pandemic period. The green line represents projections beyond 2024, and it shows that our forecast is confident at a 95% level, meaning the model captures the key seasonal patterns well and provides a solid basis for making future spending decisions.

Now we are going to see the results of In-Sample Forecasting.

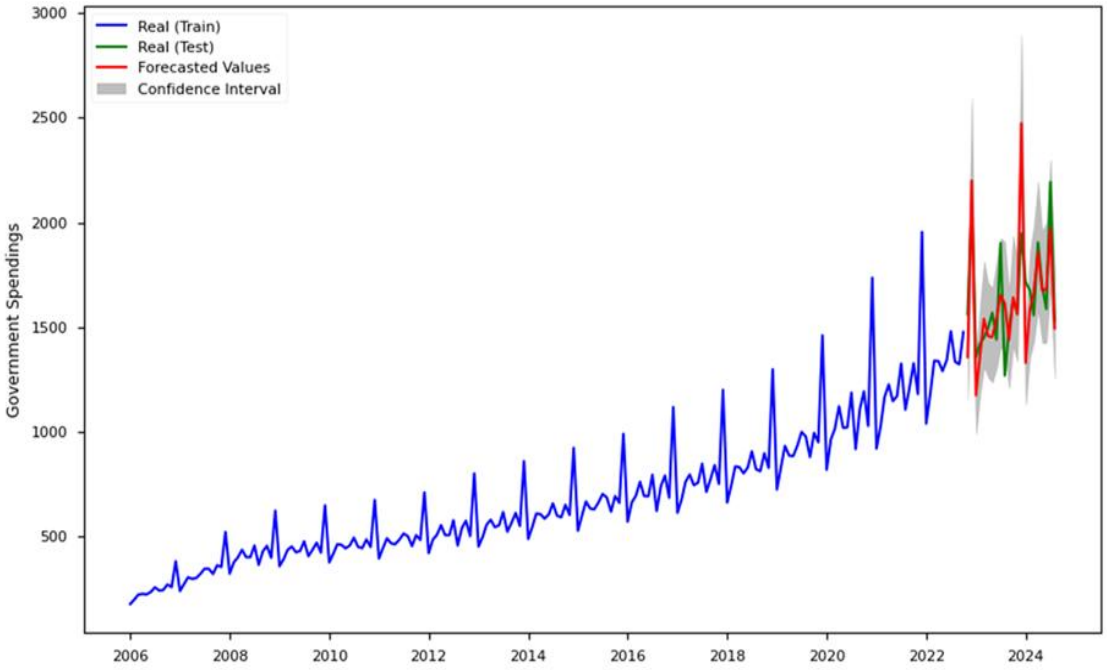

Figure 5. **Government Spending In-sample Forecast**

Source: Authors' computations based on data of Ministry of Finance of Georgia (2024).

The blue line in this graph (Figure 5) shows the real spending data used for training the model, while the green line represents the test set - data that the model had never seen before. The red line shows our forecasted values, while the gray area indicates the confidence interval. Importantly, the model's forecast was accurate within the 95% confidence interval, demonstrating its ability to generalize to new data effectively. The Mean Absolute Percentage Error (MAPE = 1.89%) further underscores the precision of the model, indicating only a small margin of error between the forecasted and the real values.

Conclusions

Economic uncertainty is becoming an increasingly important factor in global politics. Global events (crises, elections, pandemics, conflicts) have a major impact on uncertainty. Data show that uncertainty is no longer a local problem – it affects the entire world.

Economic uncertainty and forecasting of government spending using neural networks is an important topic, especially in the context of dynamic economic development and global changes. Neural networks and other artificial intelligence methods are becoming important tools for analysis and forecasting in the economy, including the area of government spending.

The Prophet neural network model was chosen to forecast government spending in Georgia, as it captures periodic trends in the data quite well.

To conclude, by using the Prophet model for both Out-of-Sample and In-Sample forecasting, we were able to produce reliable and accurate projections of government spending in Georgia, even through unpredictable periods like the pandemic.

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Valdības izdevumu prognozēšana ekonomikas attīstības kontekstā ekonomiskās nenoteiktības apstākļos

Kopsavilkums

Ekonomiskā nenoteiktība rada būtiskus izaicinājumus ekonomikas attīstībai, jo kļūst grūtāk prognozēt nākotnes ekonomiskos apstākļus, kas ietekmē tādus aspektus kā investīciju lēmumi un nodarbinātības līmenis. Šajā kontekstā īpaši svarīga kļūst valsts izdevumu prognozēšana. Valdības izdevumu prognozēšana, izmantojot neironu tīklus, ir svarīgs instruments, lai pārvaldītu ekonomisko nenoteiktību. Tas nodrošina efektīvu resursu sadali, ekonomikas stabilizāciju, risku mazināšanu, investoru uzticību, atbalsta ilgtermiņa mērķus un fiskālās politikas elastību. Ekonomikas attīstības kontekstā pareiza izdevumu prognozēšana nodrošina valdībām ceļvedi, kā efektīvi pārvaldīt nepastāvību un

turpināt ceļu uz izaugsmi un attīstību. Neironu tīklu izmantošana valdības izdevumu prognozēšanai kļūst arvien svarīgāka, ņemot vērā mūsdienu ekonomikas pieaugošo sarežģītību un neparedzamību. Neironu tīkli, mašīnmācīšanās apakškopa, piedāvā vairākas priekšrocības salīdzinājumā ar tradicionālajām prognozēšanas metodēm, jo īpaši saistībā ar valdības izdevumiem, kas var būt atkarīgi no daudziem dinamiskiem un savstarpēji saistītiem faktoriem.

Atslēgas vārdi: ekonomiskā nenoteiktība, valdības izdevumi, neironu tīkls, prognozēšana.

Aina Čaplinska (Latvija)

FINTECH ATTĪSTĪBAS TENDENCES BALTIJAS VALSTĪS

Globālā FinTech nozare piedzīvo strauju izaugsmi, ko veicina informācijas tehnoloģiju attīstība, padarot finanšu pakalpojumus pieejamākus un efektīvākus. Kopš 2019. gada FinTech uzņēmumi ir pieredzējuši strauju attīstību visā pasaulē, to skaits ir vairāk nekā dubultojies. Latvijā FinTech uzņēmumi veido ceturtdaļu no visiem Latvijas jaunuzņēmumiem (Fintech Pulse 2023), un to vidū ir vieni no veiksmīgākajiem un visstraujāk augošajiem FinTech uzņēmumiem Eiropā. Latvijas finanšu sektora uzņēmumi ievieš un izmanto inovācijas, kas uzlabo klientu pieredzi un nodrošina mūsdienīgus un ērtus pakalpojumus klientiem. Tehnoloģiju integrācija finanšu industrijā ir ne vien nepieciešama, bet arī neizbēgama, lai efektivizētu finanšu procesus un piedāvātu inovatīvus produktus un pakalpojumus. Integrācija demonstrē tehnoloģiju un inovāciju svarīgo lomu ekonomikas attīstībā, jo tieši šie aspekti ir pamatā produktivitātes uzlabošanai un jaunu ekonomisko iespēju radīšanai. Salīdzinot Latvijas progresu ar citām Eiropas Savienības valstīm, ir redzams, ka Latvija pašlaik atpaliek tehnoloģiju attīstībā (Finanšu Ministrija 2023). Raksta tēma tika izvēlēta, lai saprastu, kādi faktori ietekmē FinTech uzņēmumu izaugsmi, skaitu Latvijā, valsts kā mītnes zemes pievilcību ārvalstu finanšu tehnoloģiju uzņēmumiem. Raksta mērķis ir pētīt un analizēt FinTech nozares attīstību Latvijā, salīdzinot ar citām Baltijas valstīm. Pētījuma mērķa sasniegšanai izvirzīti uzdevumi: pētīt un vērtēt FinTech attīstības dinamiku Latvijā, salīdzinot ar attīstību Baltijas valstīs, noteikt galvenās tendences un izaicinājumus un veikt secinājumus. Lai nodrošinātu Latvijas FinTech nozares konkurētspēju un ilgtspējīgu attīstību, nepieciešams turpināt attīstīt un pilnveidot regulatīvo vidi, īpaši koncentrējoties uz jaunu tehnoloģiju integrāciju un starptautisko sadarbību. Ir būtiski ieguldīt digitālajā infrastruktūrā un IKT izglītībā, lai uzlabotu vietējo tehnoloģisko kapacitāti un konkurētspēju. Lai mazinātu investīciju svārstīgumu, jāizstrādā politikas un instrumenti, kas nodrošina stabilitāti un pievilcību investoriem, piemēram, nodokļu atvieglojumi un riska mazināšanas mehānismi. Svari investēt un attīstīt valsts digitālo infrastruktūru, nodrošinot stabilu un ātru interneta savienojumu visā Latvijā, kā arī atbalstīt FinTech uzņēmumus ar moderniem drošības risinājumiem.

Atslēgas vārdi: FinTech, bankas, start-up uzņēmumi, jaunuzņēmumi.

Ievads

Jēdziens "*FinTech*" ir vārdu "finanšu" un "tehnoloģijas" kombinācija. Tas apraksta tehnoloģiju izmantošanu, lai nodrošinātu finanšu pakalpojumus un produktus patērētājiem. Tas var attiekties uz tādām jomām kā banku darbība, apdrošināšana, investīcijas – jebko, kas saistīts ar finansēm. Lai gan šis ir salīdzinoši jauns termins, *FinTech* pati par sevi nav nekas jauns. Tehnoloģijas vienmēr ir mainījušas finanšu nozari. Tomēr interneta izplatība, apvienojumā ar tādu ierīču kā viedtālruņu un planšetdatoru plašo izmantošanu, nozīmē, ka šīs izmaiņas pēdējos gados ir būtiski paātrinājušās (Arner et al. 2015).

FinTech apzīmē plašu tehnoloģisko inovāciju klāstu, kuru mērķis ir uzlabot un automatizēt finanšu pakalpojumus. Šīs inovācijas izmanto datus un algoritmus, lai nodrošinātu lietotājiem pielāgotu un netraucētu finanšu pieredzi un pakalpojumus. Fintech risinājumi aptver dažādas nozares, tostarp banku, apdrošināšanas, investīciju un maksājumu sistēmas.

Nevar nepamanīt, cik strauji attīstās *FinTech* nozare un cik populāra tā ir. Pēc Statista datiem (Statista 2024 a, b), kopējā ieguldījumu vērtība *Fintech* uzņēmumos visā pasaulē strauji pieauga laikā no 2010. līdz 2019. gadam, kad tā sasniedza 216,8 miljardus ASV dolāru. Tomēr 2020. gadā *Fintech* uzņēmumu investīcijas ievērojami samazinājās globālas pandēmijas dēļ, un 2021. gadā atkal pieauga, sasniedzot vairāk nekā 225 miljardus ASV dolāru. Kopš 2019. gada *FinTech* uzņēmumu skaits pasaulē ir vairāk nekā dubultojies, saskaitāmi vairāk nekā 26 000 *FinTech* start-up uzņēmumi (Howath 2022). Prognozē, ka globālā *FinTech* lietotāju bāze, it īpaši digitālajā maksājumu jomā, uz 2024. gadu pārsniegs 3.5 miljardus (Statista 2024 a, b).

Latvija nav izņēmums, un *FinTech* nozares attīstība ir kļuvusi par vienu no Latvijas Bankas prioritātēm, jo finanšu tehnoloģiju uzņēmumi veido ceturtdaļu no visiem Latvijas

jaunuzņēmumiem (Fintech Pulse 2023), un to vidū ir vieni no veiksmīgākajiem un visstraujāk augošajiem *FinTech* uzņēmumiem Eiropā. Zināmākie: investīciju platformas "Mintos marketplace", "Twino" un "Viainvest", aizdevumu salīdzināšanas portāls "Altero", patērētāju kreditēšanas uzņēmumi – "Creamfinance" un "4finance", "Nordigen" – *open banking FinTech* uzņēmums (konta informācijas un darījumu kategorizēšanas pakalpojumi).

Finanšu ministrijas publicētajā informatīvajā ziņojumā *"Informative Report On Latvia's FinTech Sector Development Strategy for 2022-2023"* (Finanšu ministrija 2023), rakstīts, ka salīdzinot Latvijas progresu ar citām Eiropas Savienības valstīm, konstatējams, ka Latvija atpaliek tehnoloģiju attīstībā Piemēram, Dānijā, Francijā, Vācijā, Itālijā, Polijā, Spānijā un Zviedrijā 37% finanšu pakalpojumu sniedzēju finanšu sektorā izmanto mašīnmācīšanās (MI) tehnoloģijas un 24% plāno tās ieviest, 59% strādā ar lielajiem datiem, un 18% plāno sākt tos izmantot nākamajā gadā. Salīdzinot, Latvijā tikai 7% izmanto MI tehnoloģijas, 5% - lielos datus, un tikai 1% - blokķēdes, īpaši saistībā ar gudrajiem līgumiem (Finanšu ministrija 2023).

FinTech salīdzinošā analīze Baltijas valstīs

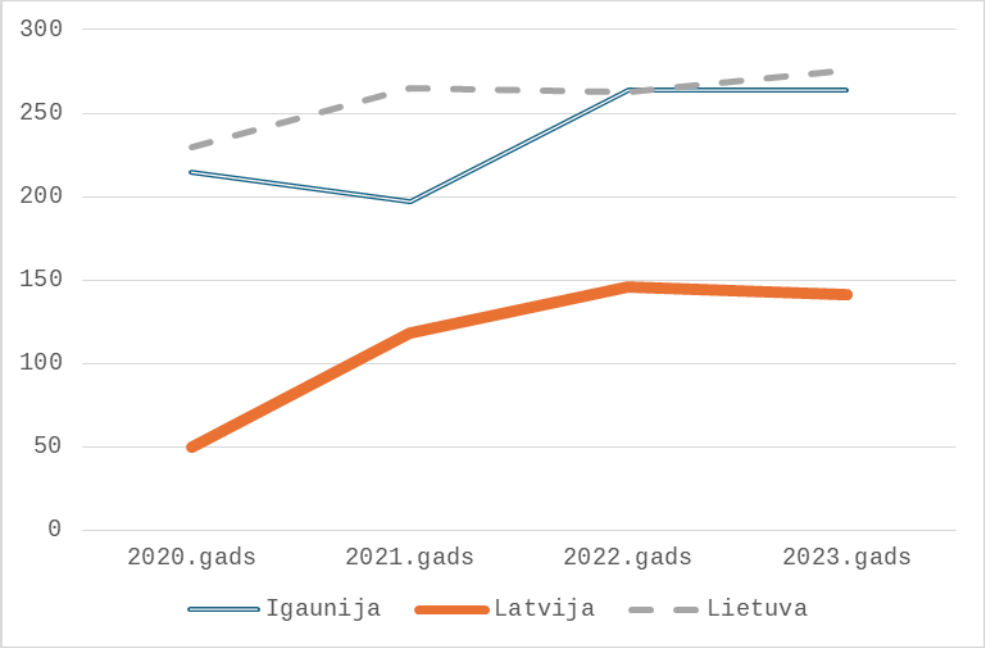
FinTech uzņēmumu panākumi lielā mērā ir atkarīgi no to darbības vides kvalitātes. Šādi uzņēmumi meklē valstis ar stabilu un pārredzamu ekonomisko, tiesisko un normatīvo vidi, kas sniedz skaidru informāciju par normatīvajām prasībām un procedūrām, kā arī nodrošina ātru un paredzamu reakciju uz izmaiņām. Vienlaikus *FinTech* uzņēmumiem nepieciešams kvalificēts darba spēks, laba reputācija un ar to saistītā infrastruktūra, kas spēj nodrošināt konkurētspējīgu un ilgtspējīgu izaugsmi (Rupeika-Apoga et al. 2020).

FinTech dinamika Baltijas valstīs aplūkota, izmantojot PEST (PEST satur četras sastāvdaļas: politiskie, ekonomiskie, sociālie un tehnoloģiskie aspekti, kas apraksta lielo priekšstatu par to, kur uzņēmējdarbība atrodas valsts vai reģionālā līmenī) analīzi. Politiskie aspekti ietvers tiesiskā regulējuma un atbalsta instrumentu salīdzinājumu, ekonomiskie aspekti tiks analizēti, ņemot vērā nodokļu politiku, iekšzemes kopproduktu (IKP) un citus ekonomiskos rādītājus. Sociālie aspekti aptvers demogrāfiskos un nodarbinātības rādītājus, kā arī informācijas un komunikācijas tehnoloģiju (IKT) speciālistu pieejamību, bet tehnoloģiskie aspekti ietvers savienojamības rādītājus un digitālo tehnoloģiju integrācijas līmeni. Pamatojoties uz iegūtajiem rezultātiem, būs iespējams novērtēt, kura no Baltijas valstīm ir pievilcīgāka *FinTech* uzņēmumiem.

Empīriskā metode, ko izmanto šajā rakstā, ietver vairāku indeksu salīdzināšanu un analīzi, lai iegūtu daudzpusīgu un visaptverošu priekšstatu par *FinTech* nozares attīstību Baltijas valstīs. Šī pieeja ļauj identificēt stiprās un vājās puses katrā valstī, sniedzot pamatu tālākai *FinTech* uzņēmumu stratēģiskai plānošanai un attīstībai reģionā. Šāda pieeja ļauj iegūt padziļinātu izpratni par *FinTech* nozares attīstības dinamiku Baltijas valstīs no 2019. līdz 2023. gadam un secināt par optimālajiem attīstības ceļiem un nepieciešamajiem uzlabojumiem, lai vēl vairāk veicinātu Latvijas *FinTech* nozares izaugsmi un konkurētspēju.

Baltijas valstis ir parādījušas ievērojamu izturību un apņēmību pārvarēt savas pagātnes problēmas, veicot būtiskus pasākumus, lai pārveidotu savas regulatīvās un uzraudzības funkcijas. Šīs valstis ir kļuvušas par līderiem globālajā *FinTech* nozarē, piedāvājot piemēru citām valstīm, kas saskaras ar līdzīgiem izaicinājumiem. Pateicoties augsti kvalificētam darbaspēkam, izdevīgiem nodokļu režīmiem, stingram regulējumam un spēcīgai startup kultūrai, Baltijas valstis ir labi pozicionētas, lai turpinātu attīstību *FinTech* nozarē (Crespo 2023). Statistika (2019. gads datu ierobežotības dēļ izpaliek) par *FinTech*

reģistrēto uzņēmumu skaitu sniedz priekšstatu par nozares attīstības dinamiku no 2020. līdz 2023. gadam (skatīt. 1.attēlu).



1.attēls. **Reģistrēto FinTech uzņēmumu skaits Baltijas valstīs no 2020.-2023. gadam**

Avots: autores veidots pēc Swedbank 2020; FinTech Latvia Association 2022; Fintech Latvija asociācija 2024; Statista 2024 a, b).

Igaunijas *FinTech* nozare ir piedzīvojusi zināmu svārstību ar nelielu uzņēmumu skaita samazinājumu 2021. gadā, bet kopējais skaits ir stabilizējies un saglabājies 264 uzņēmumu līmenī uz 2023. gadu, no kuriem 33% ir saistīti ar virtuālajiem aktīviem. Lietuvas *FinTech* ekosistēma ir piedzīvojusi stabilu izaugsmi, ar uzņēmumu skaitu pieaugot no 230 uzņēmumiem 2020. gadā līdz 276 uzņēmumiem 2023. gadā. Aptuveni 34% no šiem uzņēmumiem ir maksājumu uzņēmumi. Latvijas *FinTech* nozare ir piedzīvojusi ievērojamu izaugsmi no 2020. līdz 2021. gadam, ar uzņēmumu skaitu pieaugot vairāk nekā divkārt. Tomēr 2023. gadā ir vērojams neliels samazinājums līdz 141 uzņēmumam. 23% no Latvijas *FinTech* uzņēmumiem nodarbojas ar maksājumu, datu un IT risinājumu sniegšanu.

Finanšu tehnoloģiju nozare ir piedzīvojusi strauju izaugsmi Baltijas valstīs – Latvijā, Lietuvā un Igaunijā. Katrs no šiem tirgiem ir izveidojis specifiskas regulatīvās struktūras un atbalsta mehānismus, lai veicinātu *FinTech* uzņēmumu attīstību. Katrai Baltijas valstij ir savi *FinTech* uzņēmumu regulējumi un atbalsta mehānismi (Lexology 2021).

Lietuva ir kļuvusi par *FinTech* nozares līderi Baltijā, pateicoties tās progresīvajam regulējumam un plašajiem atbalsta mehānismiem (skatīt 1. tabulu) Latvija ir veicinājusi *FinTech* nozares attīstību ar dažādiem regulējumiem un atbalsta mehānismiem, cenšoties nostiprināt savas pozīcijas starptautiskajā tirgū. Igaunija izceļas ar savu digitālo attīstību un e-rezidentūras programmu, kas piesaista starptautiskus uzņēmumus.

1. tabula

FinTech regulējuma vide un atbalsta mehānismi Baltijas valstīs

Valsts	Regulējuma vide	Atbalsta mehānismi
Latvija	EMI un PI licences: Lai gan Latvijā ir pieejamas EMI un PI licences, licencēšanas process var būt ilgāks salīdzinājumā ar Lietuvu. Tomēr Latvija piedāvā atvieglojumus dokumentu pārbaudes maksās un samazinātas gada maksas pirmajos trīs darbības gados (Lexology 2021). Regulatīvā smilškaste: Latvija ir izveidojusi Inovāciju centru un Regulatīvo smilškasti, kas nodrošina konsultācijas un atbalstu jaunu finanšu produktu izstrādē un testēšanā. Tie palīdz tādiem uzņēmumiem kā Mintos un TWINO pielāgoties jaunajiem ES regulējumiem (FinTech Pulse 2023) MiCA regula: Latvija plāno to ieviest 2024.gadā.	Darbinieku akciju opcijas: No 2021. gada Latvijā ir spēkā labvēlīgi nodokļu noteikumi attiecībā uz darbinieku akciju opcijām, kas ļauj tās piedāvāt arī sabiedrībām ar ierobežotu atbildību (Lexology 2021). Pieejamība kapitāla tirgiem: MVU var saņemt kompensāciju par konsultāciju izmaksām, kas nepieciešamas akciju vai obligāciju kotēšanai (Lexology 2021
Lietuva	Elektroniskās naudas iestādes (EMI) un maksājumu iestādes (PI) licences: Lietuva ir pievilcīga ar viegli pieejamām EMI un PI licencēm. Apmēram 50% no visiem *FinTech* uzņēmumiem Lietuvā ir saņēmuši šīs licences, piemēram, Revolut, kas pārcēla savus ES klientus uz Lietuvu pēc Brexit (Lexology 2021). Speciālās bankas (SPB) licence: SPB licences piešķiršana ar zemākām kapitāla prasībām (1 miljons EUR) salīdzinājumā ar tradicionālajām bankām (5 miljoni EUR). Revolut ir viens no uzņēmumiem, kas saņēmis SPB licenci Lietuvā. MiCA regula: Lietuva gatavojas ieviest jauno ES kriptoaktīvu tirgus regulu, lai kļūtu par vadošo kripto uzņēmumu centru Eiropā (Invest Lithuania n/d).	CENTROlink sistēma: *Bank of Lithuania* piedāvā piekļuvi SEPA maksājumu sistēmām, nodrošinot tehnisko infrastruktūru maksājumu pakalpojumu sniedzējiem, piemēram, TBI Bank (Lexology 2021). Darbinieku akciju opcijas: Nodokļu atvieglojumi, ja opcijas tiek turētas vismaz trīs gadus, padara Lietuvu pievilcīgu darbiniekiem un investoriem. Invest LT+ finansiālais stimuls - iespēja kompensēt 10-20% no kopējām nodarbinātības izmaksām uz 24 mēnešiem. Kā arī samazināta uzņēmumu ienākuma nodokļa likme un R&D izmaksu atskaitīšana no apliekamajiem ienākumiem (Invest Lithuania n/d). Pieejamība kapitāla tirgiem: MVU var saņemt kompensāciju par trešo pušu konsultāciju izmaksām, kas saistītas ar akciju vai obligāciju kotēšanu (Invest Lithuania n/d). *Relocation Support Grant*: Piešķir vairāk nekā 10,000 eiro par katru augsti kvalificētu darbinieku no ārvalstīm (Invest Lithuania n/d).

Igaunija	EMI un PI licences: Igaunijā ir pieejamas EMI un PI licences ar līdzīgām kapitāla prasībām kā Lietuvā un Latvijā. Licencēšanas process ir salīdzinoši vienkāršs un ātrs, pateicoties Igaunijas Finanšu uzraudzības iestādes efektivitātei (Lexology 2021). E-rezidentūra: Igaunijas e-rezidentūras programma ļauj ārvalstu uzņēmējiem, piemēram, Wise un Veriff, attālināti izveidot un vadīt uzņēmumus, piekļūstot Igaunijas digitālajai infrastruktūrai (Laidroo et al. 2023). MiCA regula: Igaunija gatavojas ieviest jauno ES kriptoaktīvu tirgus regulu tuvākajā laikā (Laidroo et al. 2023).	Darbinieku akciju opcijas: Igaunijā nodokļu atvieglojumi darbinieku akciju opcijām tiek piemēroti, ja opcijas tiek turētas vismaz trīs gadus (Laidroo et al. 2023). *Start-up* statuss un vīzas: Igaunija piedāvā *start-up* statusu un vīzas, kas atvieglo starptautisku talantu pieņemšanu darbā un uzņēmumu dibināšanu. Šis statuss arī nodrošina piekļuvi dažādām atbalsta programmām (Laidroo et al. 2023).

Avots: autores izveidota pamatojoties uz tabulā norādītajiem avotiem.

Lietuva ir izvirzījusies kā Baltijas līdere *FinTech* regulējuma un atbalsta mehānismu jomā, pateicoties tās progresīvajam regulējumam un viegli pieejamām licencēm (EMI, PI, SPB). CENTRO link sistēma nodrošina piekļuvi SEPA maksājumu sistēmām, kas padara Lietuvu pievilcīgu starptautiskiem uzņēmumiem. Turklāt Lietuva piedāvā nodokļu atvieglojumus darbinieku akciju opcijām un ir izveidojusi spēcīgu *FinTech* ekosistēmu.

Latvija ir veicinājusi FinTech nozares attīstību ar efektīvu regulatīvo smilškasti un Inovāciju centru, kas sniedz atbalstu jaunu finanšu produktu izstrādē un testēšanā. Latvijas regulējums piedāvā labvēlīgus nodokļu noteikumus darbinieku akciju opcijām arī sabiedrībām ar ierobežotu atbildību, kā arī nodrošina pieejamību kapitāla tirgiem ar kompensācijām par konsultāciju izmaksām. Tomēr salīdzinoši sarežģīts un garš licencēšanas process un reputācijas jautājumi saistībā ar naudas atmazgāšanas novēršanu vēl ir jārisina, lai pilnībā izmantotu potenciālu.

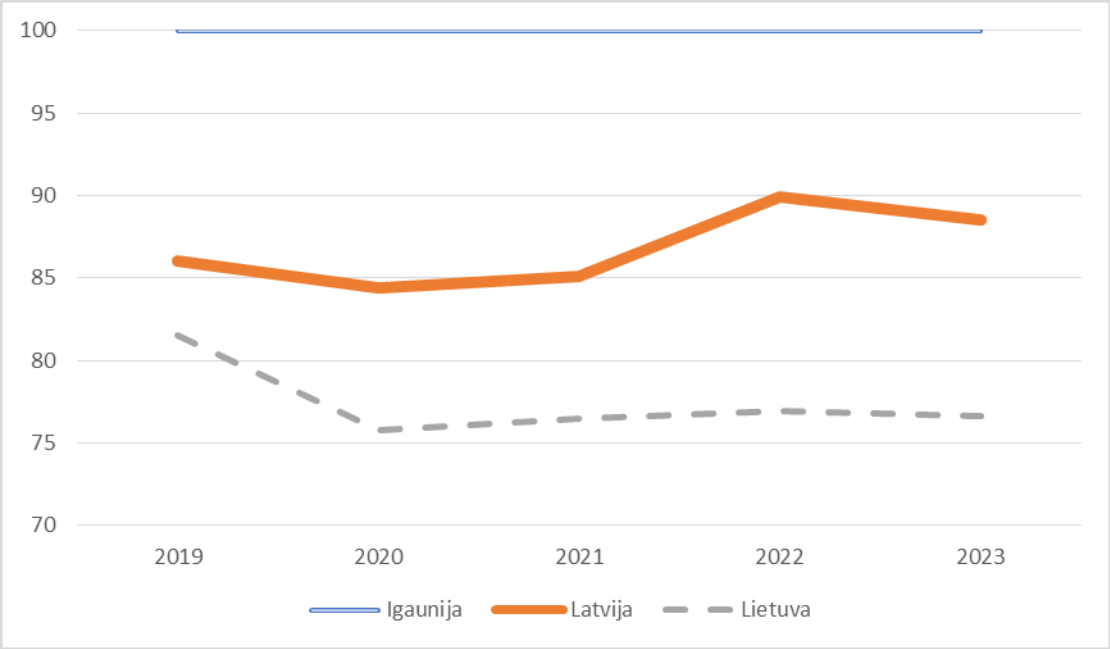
Igaunija izceļas ar savu digitālo attīstību un e-rezidentūras programmu, kas piesaista starptautiskus uzņēmējus. *Start-up* statuss un vīzas atvieglo starptautisku talantu piesaisti, un digitāli attīstīta uzņēmējdarbības vide nodrošina vieglu piekļuvi licencēm. Tomēr augstas prasības attiecībā uz uzņēmumu vietējo klātbūtni var radīt papildu izmaksas uzņēmumiem, un Igaunija salīdzinoši mazāk uzsver specializētus finanšu pakalpojumus salīdzinājumā ar Lietuvu.

Kopumā Baltijas valstis piedāvā daudzveidīgas un konkurētspējīgas iespējas *FinTech* uzņēmumiem, katra ar savām stiprajām un vājajām pusēm. Lietuva ir izvirzījusies kā līdere regulējuma un atbalsta mehānismu jomā, kamēr Latvija un Igaunija arī veic būtiskus soļus, lai piesaistītu un attīstītu *FinTech* nozari savās valstīs, bet viss var mainīties ar MiCA regulējuma ieviešanu, kas ļaus drošā regulētā vidē attīstīt un paplašināt strauji augošā FinTech jomā strādājošo uzņēmumu skaitu arī Latvijā. Viens no priekšnoteikumiem kļūt par *FinTech* uzņēmumiem pievilcīgu galapunktu ir attīstīta ekonomiskā vide. *FinTech* uzņēmējdarbību ietekmē vispārējā ekonomiskā vide valstī, piemēram, ekonomikas izaugsme, ekonomiskā politika, nodokļu likmes, darījumu veikšanas vienkāršība un izmaksas.

Zemas nodokļu likmes ir būtisks faktors, izvēloties uzņēmumu atrašanās vietu. *International Tax Competitiveness Index* (ITCI) (Mengden 2024), kas novērtē valstu

nodokļu sistēmu konkurences spēju un neitralitāti, sniedz ieskatu par to, kā nodokļu politika ietekmē ekonomisko vidi. Analizējot Baltijas valstis laika posmā no 2019. līdz 2023. gadam, ir redzams, ka Igaunija saglabāja stabilu pozīciju kā augstāk novērtētā valsts ar konsekventu pirmo vietu un maksimālu 100 punktu reitingu (Mengden 2024). Šis augstais reitings norāda uz Igaunijas nodokļu sistēmas efektivitāti un uzņēmējdarbībai draudzīgo vidi.

Latvija arī demonstrēja augstu konkurenci, saglabājot otro vietu no 2020. gada un uzrādot punktu skaita pieaugumu no 86 punktiem 2019. gadā līdz 88,5 punktiem 2023. gadā (Mengden 2024). Šis pieaugums atspoguļo Latvijas spēju veicināt uzņēmējdarbības vidi, optimizējot savu nodokļu struktūru. Lietuva, lai arī sākotnēji bija augstu novērtēta, piedzīvoja nelielu kritumu savā pozīcijā, no ceturtās vietas 2019. gadā līdz devītajai vietai 2023. gadā, ar punktu skaitu, kas svārstījās ap 76 punktiem (Mengden 2024). Šis kritums var norādīt uz relatīvām grūtībām saglabāt nodokļu sistēmas konkurētspēju salīdzinājumā ar citām OECD valstīm (skatīt. 2.attēlu).



2. attēls. **Starptautiskais nodokļu konkurētspējas indekss Baltijas valstīs no 2019. – 2023. gadam (punktu skaits)**

Avots: autores veidots pēc Mengden (2024) datiem.

Uzņēmumu ienākuma nodokļa (UIN) apmērs ir izšķirīgs faktors uzņēmumu konkurētspējai un piesaistītībai, jo tas ietekmē peļņas maržas un investīciju potenciālu. Zemākas UIN likmes var veicināt peļņas reinvestēšanu, paplašināšanos un algas palielināšanu, kas savukārt veicina ekonomisko izaugsmi. Latvija saglabāja 25% UIN likmi visā novērtētajā periodā, nodrošinot fiskālo stabilitāti un paredzamību, kas ir būtiski investoru acīs. Lietuva arī saglabāja stabilitāti ar 15% likmi, kas ir zemākā starp Baltijas valstīm, piedāvājot ļoti konkurētspējīgu vidi uzņēmumiem. Igaunija piedāvāja 20% likmi, kas piemērojama tikai izmaksātajai peļņai, veicinot uzņēmumu kapitāla reinvestēšanu un ilgtspējīgu izaugsmi (skatīt. 2.tabulu).

2. tabula

Uzņēmuma ienākuma nodoklis Baltijas valstīs no 2019.-2023.gadam (%)

	2019.gads	2020.gads	2021.gads	2022.gads	2023.gads
Igaunija	20%	20%	20%	20%	20%
Latvija	25%	25%	25%	25%	25%
Lietuva	15%	15%	15%	15%	15%

Avots: autores veidots pēc EYGM Limited (2024) datiem.

Pievienotās vērtības nodoklis (PVN) ir svarīgs, jo tas tieši ietekmē uzņēmumu izmaksas un to produktu un pakalpojumu gala cenas. Stabils PVN likmes līmenis palīdz uzņēmumiem prognozēt izmaksas un cenu politiku. Visās trīs Baltijas valstīs PVN likmes palika stabilas visā apskatītajā periodā. Latvija un Lietuva saglabāja 21% likmi, savukārt Igaunija piedāvāja nedaudz zemāku likmi 20% apmērā. Šīs stabilitātes sniedz uzņēmumiem skaidru izmaksu struktūru, kas ir īpaši svarīgi mazo un vidējo uzņēmumu sektoram. (skat. 3.tabulu).

3.tabula

Pievienotās vērtības nodoklis Baltijas valstīs no 2019.-2023. gadam (%)

	2019.gads	2020.gads	2021.gads	2022.gads	2023.gads
Igaunija	20%	20%	20%	20%	20%
Latvija	21%	21%	21%	21%	21%
Lietuva	21%	21%	21%	21%	21%

Avots: autores veidots pēc EYGM Limited (2024) datiem.

Iedzīvotāju ienākuma nodokļa (IIN) apmērs ietekmē darba tirgus elastīgumu un darbaspēka mobilitāti, kā arī iedzīvotāju pirktspēju. Latvija saglabāja progresīvu IIN sistēmu ar augstāko likmi 31% peļņai virs EUR 78,100, kas nodrošina pietiekamus valsts ieņēmumus no augstākajiem ienākumiem. Lietuva un Igaunija piedāvāja vienotu 20% likmi, kas veicina vienkāršu un prognozējamu nodokļu vidi. Zemāki IIN likmes veicina lielāku darba piedāvājumu un var palielināt privāto patēriņu (skat.4. tabulu).

4.tabula

Iedzīvotāju ienākuma nodoklis Baltijas valstīs no 2019.-2023. gadam (%)

	2019.gads	2020.gads	2021.gads	2022.gads	2023.gads
Igaunija	20%	20%	20%	20%	20%
Latvija	20% ienākumiem līdz 20 004 EUR, 23% ienākumiem no 20 004 EUR līdz 78 100 EUR un 31% ienākumiem virs 78 1001 EUR.				
Lietuva	20%	20%	20%	20%	20%

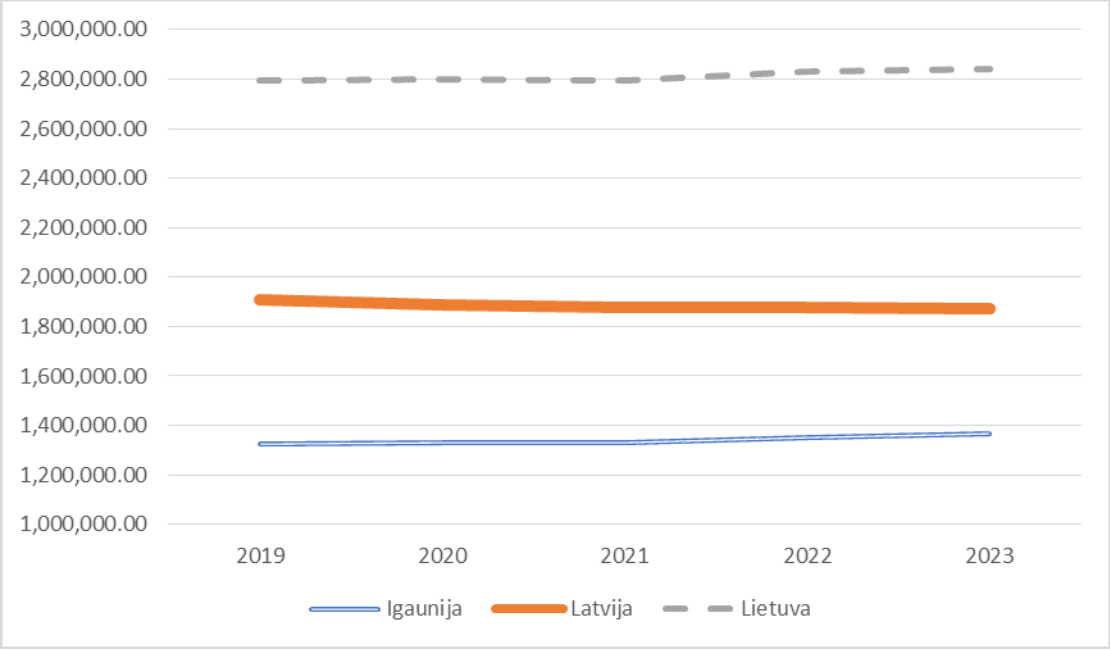
Avots: autores veidots pēc EYGM Limited (2024) datiem.

Secinot, šie nodokļu politikas aspekti Baltijas valstīs piedāvā unikālu vidi *FinTech* uzņēmumiem. Latvija ar savu nodokļu politiku veido stabilitāti, kas ir pievilcīga lielākiem *FinTech* uzņēmumiem, kas meklē prognozējamu un stabilu vidi. Lietuva, piedāvājot zemāko UIN, ir īpaši pievilcīga jauniem un augošiem *FinTech* uzņēmumiem, kas vēlas maksimizēt sākotnējo peļņu un atbalstīt kapitāla uzkrāšanu. Igaunija, ar savu unikālo UIN

sistēmu, kas piemēro nodokli tikai izmaksātajai peļņai, ir ideāla vieta *FinTech start-up* uzņēmumiem, kas plāno atkārtoti ieguldīt peļņu, lai veicinātu izaugsmi un inovācijas.

Vērtējot sociālos aspektus saskaņā ar PEST analīzi, demogrāfiskās tendences un kvalificēts, izglītots darbaspēks izceļas kā vieni no svarīgākajiem rādītājiem *FinTech* uzņēmumu konkurētspējai un attīstībai. Šie faktori ir būtiski, jo demogrāfiskās tendences nosaka darbaspēka pieejamību un struktūru, savukārt kvalificēts darbaspēks ir kritisks inovāciju veicināšanai un tehnoloģiju integrācijai, kas ir *FinTech* nozares pamats. Spējot piesaistīt un noturēt talantīgus speciālistus, uzņēmumi var nodrošināt augstu konkurētspēju un ilgtspējīgu izaugsmi. Demogrāfiskās tendences tiks aplūkotas, izmantojot *The World Bank* (The World Bank Group n/d) un *Eurostat* (Eurostat 2023) statistiku, kas sniegs detalizētu pārskatu par iedzīvotāju struktūru un izmaiņām Baltijas valstīs. Papildus tam, IMD pasaules talantu reitings, kurš vērtē ekonomikas spēju attīstīt, piesaistīt un noturēt augsti kvalificētus speciālistus, balstoties uz tādiem rādītājiem kā investīcijas un attīstība, pievilcība un gatavība.

Pētot *Eurostat* statistiku (Eurostat 2023), redzams, ka Baltijas valstu iedzīvotāju skaits pēdējo piecu gadu laikā ir mainījies dažādos veidos. Igaunijas iedzīvotāju skaits pa šo periodu pieaudzis par 41 671, Lietuvā iedzīvotāju skaits palielinājies par 46 950, bet Latvijā vērojama iedzīvotāju skaita samazināšanās par 33 855 (skatīt.5.attēlu).



3. attēls. **Demogrāfiskās tendences Baltijas valstīs no 2019.-2023.gadam (milj.)**

Avots: autores veidots pēc The World Bank Group (n/d).

Nodarbinātības rādītāji no *The World Bank* parāda līdzīgu dinamiku. Igaunijā nodarbinātības līmenis saglabājies relatīvi stabils, samazinoties no 79.0% 2019. gadā līdz 78.0% 2023. gadā, neskatoties uz iedzīvotāju skaita pieaugumu. Latvijā nodarbinātība ir pieaugusi no 76.4% 2019. gadā līdz 77.0% 2023. gadā, pat iedzīvotāju skaitam samazinoties. Lietuvā nodarbinātība pieaugusi no 77.4% 2019. gadā līdz 78.4% 2023. gadā, atspoguļojot iedzīvotāju skaita pieaugumu (skatīt 5.tabulu).

5.tabula

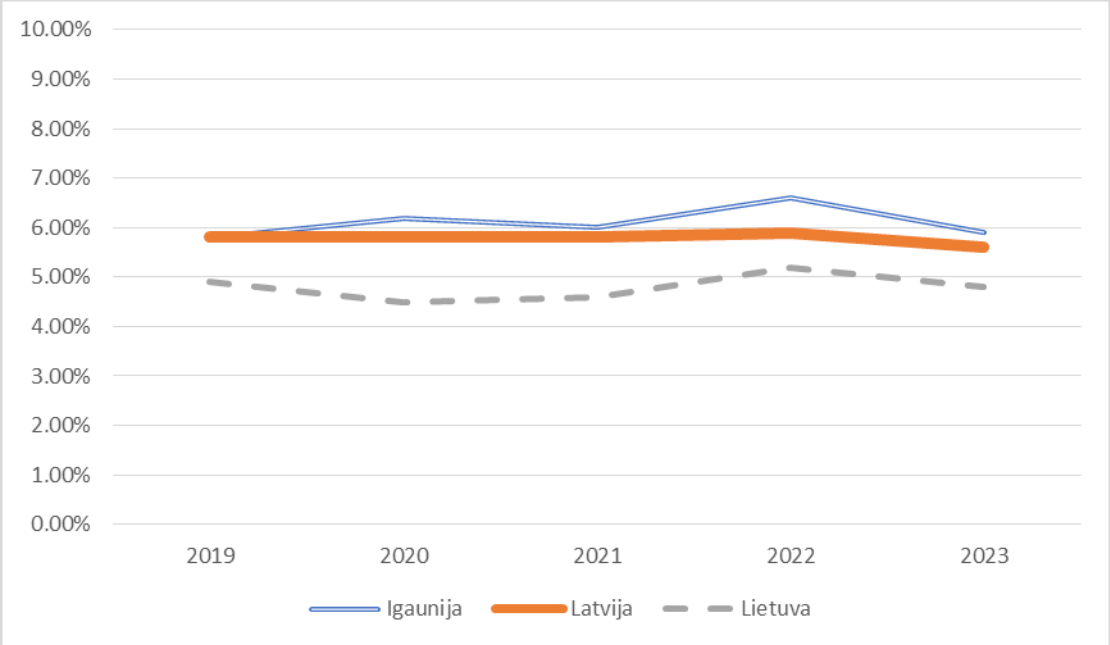
Nodarbinātības līmenis vecumgrupās no 20 līdz 64 gadiem Baltijas valstīs no 2019.-2023. gadam (%)

	2019.gads	2020.gads	2021.gads	2022.gads	2023.gads
Igaunija	79,00%	76,70%	76,6%	77,3%	78%
Latvija	76,4%	75,4%	75,3%	76,5%	77%
Lietuva	77,4%	76%	76,2%	77,6%	78,4%

Avots: autores veidots pēc Eurostat (2024) datiem.

Igaunijas iedzīvotāju skaita pieaugums kopā ar stabilu nodarbinātības līmeni liecina par pieaugošu darbaspēka bāzi un stabilu ekonomisko vidi, kas ir pievilcīga *FinTech* uzņēmumiem. Lietuva arī piedāvā pievilcīgu vidi ar pieaugošu iedzīvotāju skaitu un uzlabojošu nodarbinātības līmeni. Latvijā, neskatoties uz iedzīvotāju skaita samazināšanos, nodarbinātības pieaugums norāda uz darba tirgus elastību un potenciālu. Tomēr, lai uzturētu konkurētspēju, Latvijai būs nepieciešams turpināt uzlabot savus demogrāfiskos apstākļus.

Analizējot IMD pasaules talantu reitinga sadaļu "Investīcijas un attīstība" pēdējo piecu gadu laikā, mēs redzam, ka visās trīs Baltijas valstīs ir vērojamas dažādas tendences. Igaunija ir noturējusies augstu reitingā, sasniedzot 10. vietu 2020. un 2022. gadā, kas norāda uz spēcīgu un konsekventu valsts politiku talantu attīstībā. Latvijas pozīcija reitingā ir nedaudz pasliktinājusies no 12. vietas 2019. gadā līdz 21. vietai 2023. gadā, kas varētu liecināt par relatīvi zemāku prioritāti izglītības un attīstības jomā. Lietuva ir saglabājusi līdzīgu pozīciju ar nelielu svārstīgumu, kas liecina par stabilitāti, taču bez izteiktiem uzlabojumiem (IMD 2024).



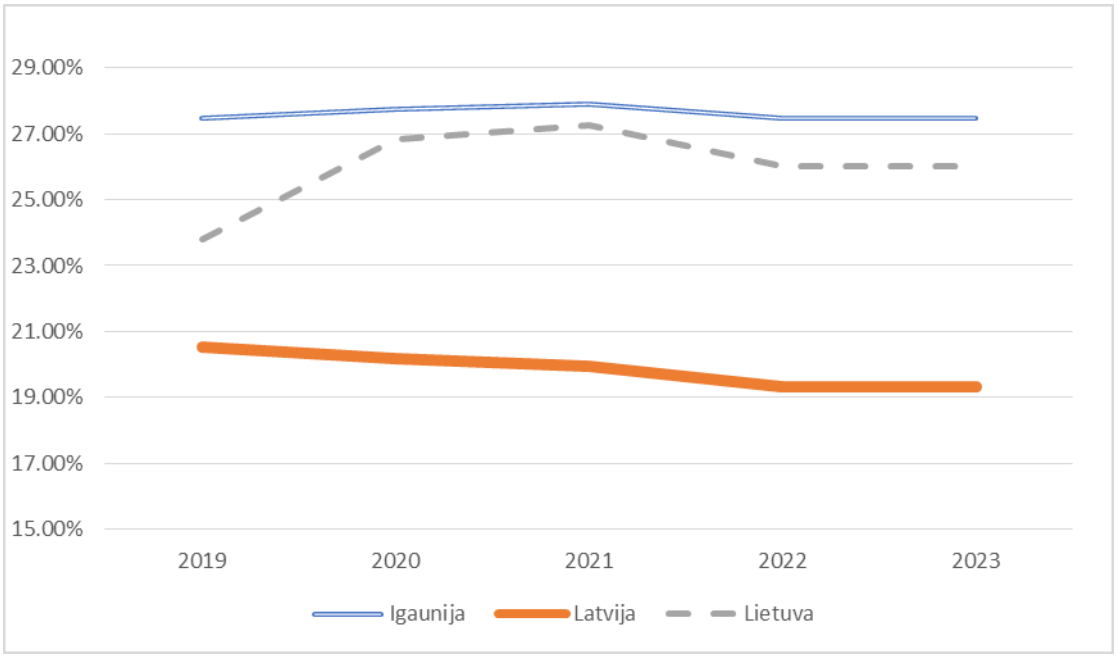
4.attēls. **Kopējie valsts izdevumi izglītībai Baltijas valstīs 2019.-2023.gados (% no IKP)**

Avots: autores veidots pēc IMD (2024) datiem.

Sīkāk aplūkojot kopējos valsts izdevumus izglītībai kā procentuālo daļu no IKP, Igaunija izceļas ar augstākiem izdevumiem un augstāku vietu reitingā, kas pastāvīgi pārsniedz 6% līmeni līdz 2023. gadam, kad izdevumi nedaudz samazinājās. Latvija saglabājusi gandrīz nemainīgu procentuālo likmi ar nelielu samazinājumu 2023. gadā. Lietuvas izdevumi izglītībai ir bijuši zemāki un mazāk stabili, kas 2023. gadā atgriezās pie 4.8%, kas ir zemāks nekā Igaunijā un Latvijā (skatīt 4.attēlu).

Šī informācija norāda, ka Igaunija ir prioritizējusi izglītību un attīstību, kas varētu būt pievilcīga faktora *FinTech* nozarei, jo šāda pieeja nodrošina labi izglītotu darbaspēku, kas ir svarīgs inovatīvas un tehnoloģiju intensīvas nozares attīstībai. Latvijas un Lietuvas stabilās, bet salīdzinoši zemākas investīcijas izglītībā varētu prasīt papildu pūles, lai piesaistītu *FinTech* uzņēmumus, kuras meklē augstas kvalitātes darbaspēku.

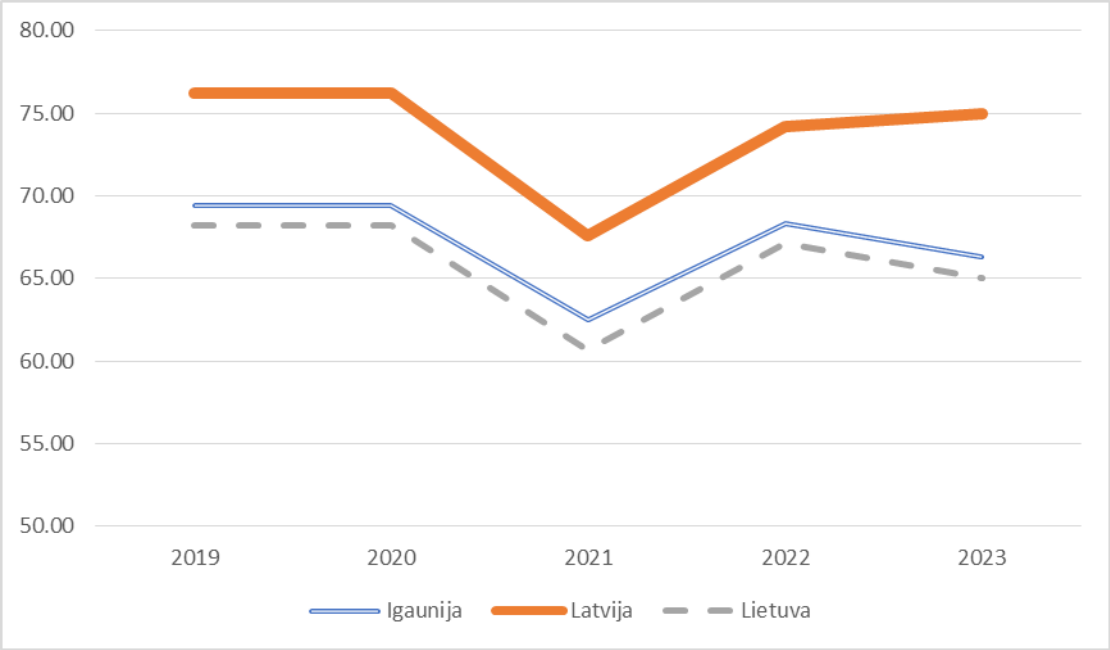
Igaunijas, Latvijas un Lietuvas sniegums IMD pasaules talantu reitingā (IMD 2024) pēdējo piecu gadu laikā atklāj nozīmīgas atšķirības un tendences. Igaunija uzlaboja savu pozīciju no 35. vietas 2019. gadā uz 20. vietu 2023. gadā. Uzlabojums par 15 vietām liecina par veicinošām politikām un investīcijām prasmju attīstīšanā un talantu piesaistē. Lietuvai ir stabils sniegums, ar pozīcijām starp 35. un 31. vietu, norādot uz likumsakarīgu pieeju talantu attīstīšanā. Pretstatā, Latvija ir pieredzējusi kritumu no 48. vietas 2019. gadā uz 58. vietu 2023. gadā, kas var būt traktējama kā problēma talantu noturēšanā un piesaistīšanā (IMD 2024). Igaunija ir saglabājusi stabilu absolventu skaitu šajās disciplīnās, nedaudz svārstoties ap 27%, kas norāda uz stabilitāti izglītības sistēmā. Lietuva ir pierādījusi uzlabojumus šajā rādītājā, kas svārstījās no 24% 2019. gadā līdz 26% 2023. gadā, kas norāda uz pozitīvu tendenci izglītības politikā un studentu interesi par jomu. Savukārt, Latvijā absolventu skaita samazinājums no 21% 2019. gadā līdz 19% 2023. gadā, kas var liecināt par nepietiekamu atbalstu zinātņu jomai (skatīt 5. attēlu).



5.attēls. **Absolventu skaits zinātņu jomā (IKT, inženierzinātnēs, matemātikā un dabaszinātnēs) Baltijas valstīs no 2019.-2023.gadam (%)**

Avots: autores veidots pēc IMD (2024) datiem.

Attiecībā uz dzīves dārdzības indeksu, Igaunijas rādītāji 2019. gadā bija 69.4, bet 2023. gadā samazinājās līdz 66.27, liecinot par nelielu dzīves izmaksu samazinājumu. Lietuvas indekss 2019. gadā bija 68.2, kas līdz 2023. gadam samazinājās līdz 65.02, liecinot par stabilitāti dzīves izmaksās. Latvijas indekss, savukārt, 2019. gadā sasniedza 76.2, bet 2023. gadā palielinājās līdz 74.95, kas varētu norādīt uz augstākām izmaksām un potenciālu barjeru starptautisko talantu piesaistīšanai (skatīt.6.attēlu).



6.attēls. **Dzīves dārdzības indekss Baltijas valstīs 2019.-2023.gados**

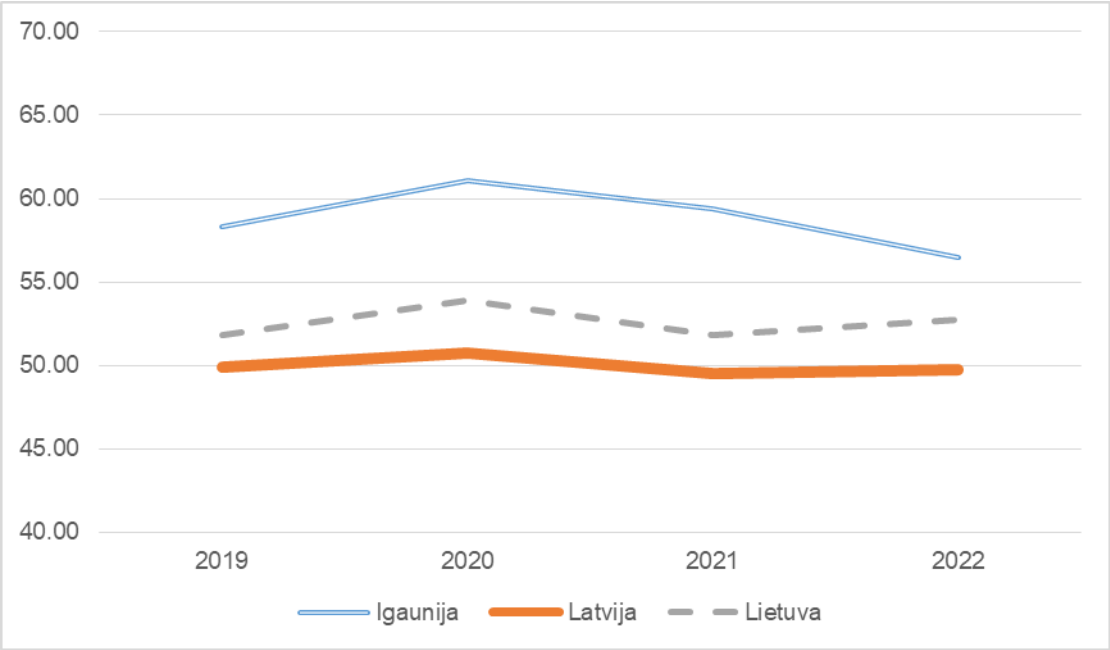
Avots: autores veidots pēc IMD (2024) datiem.

Analizētie dati liecina, ka Igaunijā un Lietuvā ir izdevies efektīvāk piesaistīt talantus, uzturot salīdzinoši zemas dzīves izmaksas, kas veicina to pievilcību. Latvijai, lai saglabātu konkurētspēju, būtu jāveic pasākumi, lai uzlabotu savu pievilcību un mazinātu dzīves dārdzību. Minētie faktori pamato *FinTech* uzņēmumiem izvēlēties Igauniju vai Lietuvu kā mītnes zemi, kurā veidot un attīstīt uzņēmējdarbību.

FinTech, izvēloties valsti, kur uzsākt biznesu ir būtiski izvērtēt tehnoloģiju attīstību un zinātnes progresu tajā. Lēmuma pieņemšanā svarīga loma ir valsts spējai atbalstīt jaunu tehnoloģiju izstrādi un ieviešanu, kā arī institucionālajiem mehānismiem, kas veicina tehnoloģisko inovāciju. Ātrs tehnoloģiskais progress un spēcīga institucionālā atbalsta sistēma var būtiski ietekmēt *FinTech* uzņēmumu spēju attīstīties un konkurēt pasaules tirgū. Svarīgi par mītnes zemi izvēlēties valsti, kura nodrošina labvēlīgu vidi tehnoloģiju attīstībai un inovāciju ieviešanai.

Digitālās ekonomikas un sabiedrības indeksa (DESI) dati ir pieejami laika periodā no 2019. līdz 2022. gada, tāpēc analizējot tos redzam, ka Baltijas valstis demonstrē dažādus rezultātus (European Commission 2023). Igaunija, kas ilgstoši bija viena no līderēm, 2019. gadā ieņēma piekto vietu ar 58,3 punktiem, bet līdz 2022. gadam tās pozīcija saruka līdz devītajai vietai ar 56,5 punktiem. Šis samazinājums var liecināt par izaicinājumiem uzturēt tehnoloģiju attīstības tempu. Latvija sāka ar 15. vietu 2019. gadā ar 49,9 punktiem un saglabāja līdzīgu pozīciju, neskatoties uz nelielu punktu kritumu līdz 2022. gadam. Šis konsekventais, bet zem vidējā Eiropas līmeņa rādītājs atklāj telpu uzlabojumiem digitālo

pakalpojumu un infrastruktūras attīstībā. Lietuva, kas 2019. gadā bija 12. vietā ar 51,8 punktiem, līdz 2022. gadam zaudēja dažas pozīcijas, noslīdot uz 14. vietu. Tomēr punktu skaita pieaugums līdz 52,7 norāda uz pakāpenisku progresu, kas tomēr nepietiek, lai tā iegūtu augstāku vietu DESI indeksā (skatīt 7.attēlu).



7.attēls. **Digitālās ekonomikas un sabiedrības indekss (DESI) 2019.-2022.gados (punktu skaits)**

Avots: autores veidots pēc European Commission (2024) datiem.

Detalizēti izanalizējot DESI rādītāji dažādos laika periodos, izejot no to pieejamības Baltijas valstu atskaitēs, apskatot DESI radītājus "Savienojamība" sadaļā ir skaidri redzams, ka Latvija ar savu 20. vietu ES reitingā izceļas ar ļoti augstas veiktspējas fiksēto tīklu (VHCN) pārklājumu, kas ir pieaudzis no 88% 2020. gadā līdz 91% 2022. gadā (European Commission 2024). Šis rādītājs ir svarīgs, jo Latvija tiecas izpildīt digitālās desmitgades mērķi līdz 2030. gadam, garantējot 100% gigabitu tīklu pieejamību visām mājsaimniecībām (Valsts kanceleja 2024). Turpretī Igaunija un Lietuva arī uzrāda uzlabojumus VHCN pārklājumā, taču ar zemākiem kopējiem rādītājiem — 73% un 78% attiecīgi 2022. gadā. 5G tehnoloģiju ieviešana ir vēl viens būtisks faktors, kur Latvija parāda progresu ar 63% pārklājumu 2022. gadā, kamēr Igaunija un Lietuva joprojām atpaliek ar zemākiem rādītājiem (European Commission 2024).

Mobilo platjoslas tīklu izmantošana arī uzrāda līdzīgu tendenci, kur Latvija no 2020. gada līdz 2022. gadam uzrādīja ievērojamu pieaugumu no 74% līdz 86%, turpretī Igaunija un Lietuva arī uzrāda nelielu pieaugumu (European Commission 2024).

Šie rādītāji norāda uz Latvijas spēju nodrošināt augstas kvalitātes un pieejamu savienojamību, kas ir svarīgi *FinTech* nozarei. Augstas kvalitātes internets ir būtisks ne tikai datu pārsūtīšanai un apstrādei, bet arī inovāciju un jaunu digitālo pakalpojumu ieviešanai. Tas nozīmē, ka Latvija var piedāvāt labvēlīgu vidi *FinTech* uzņēmumiem, veicinot to izaugsmi un inovāciju potenciālu.

Pētot DESI rādītājus sadaļā "Digitālie publiskie pakalpojumi", Igaunija izceļas ar pirmo vietu, demonstrējot augstu e-pārvaldes lietotāju līmeni, kas izauga no 88% līdz 89%

no 2019. līdz 2022. gadam, savukārt Latvija un Lietuva, arī uzrādot uzlabojumus, tomēr ierindojas zemāk - attiecīgi 11. un 10. vietā (European Commission 2024). Latvijas e-pārvaldes lietotāju līmenis pieauga līdz 85% 2021. gadā, bet 2022. gadā nedaudz samazinājās līdz 84%. Lietuvas rādītājs pakāpeniski palielinājās no 63% 2019. gadā līdz 70% 2022. gadā. Konkrēti skatoties uz digitālajiem publiskajiem pakalpojumiem iedzīvotājiem un uzņēmumiem 2022. gadā, Igaunijas rezultāti ir iespaidīgi augsti, sasniedzot 92 iedzīvotājiem un 98 uzņēmumiem, kas ir ievērojami virs ES vidējā (75 iedzīvotājiem un 82 uzņēmumiem) rādītāja Latvijas un Lietuvas rādītāji arī ir augsti, bet nedaudz zemāki nekā Igaunijas, ar Latvijas rezultātiem 87 iedzīvotājiem un 86 uzņēmumiem, un Lietuvas attiecīgi 82 un 93 (European Commission 2024).

Dati liecina, ka Baltijas valstīs ir augsta digitālo publisko pakalpojumu pieejamība un efektivitāte, kas ir īpaši nozīmīgi *FinTech* nozarei. Augstie rādītāji Igaunijā norāda uz izcilu digitālo infrastruktūru un e-pārvaldi, kas veicina tehnoloģiju pieņemšanu un nodrošina efektīvu biznesa vidi *FinTech* uzņēmumiem. Tas piedāvā ātru un drošu piekļuvi svarīgai informācijai, atbalsta pakalpojumiem un valsts resursiem, veicinot darbības efektivitāti un inovāciju ieviešanu. Augsti digitālo pakalpojumu rādītāji Baltijas valstīs veicina ne tikai vietējo, bet arī starptautisko investoru un klientu uzticēšanos, kas ir izšķirīgi svarīgi dinamiski augošās *FinTech* nozares attīstībā un konkurētspējas stiprināšanā.

Analizējot DESI radītājus sadaļā "Digitālo tehnoloģiju integrācija" (2022. gada dati), Latvija ar 23. vietu atpalika no Igaunijas 15. vietas un Lietuvas 13. vietas (European Commission (2024). Secināms, ka Lietuva un Igaunija ir integrējušas digitālās tehnoloģijas uzņēmējdarbībā efektīvāk nekā Latvija.

Konkrēti skatoties uz lielajiem datiem, visās trīs valstīs izmantošana ir zemāka nekā ES vidējais rādītājs (14%). Igaunija un Latvija ir pieredzējušas nedaudz samazinājumu lielajos datos, kamēr Lietuva, sākot ar augstāko 2020. gada līmeni (14%), ir samazinājusi izmantošanu līdz 11% 2022. gadā. Mākoņpakalpojumu izmantošana Latvijā (22%) ir ievērojami zemāka nekā Igaunijā (51%) un Lietuvā (28%), kas norāda uz nepieciešamību palielināt mākoņdatošanas tehnoloģiju integrāciju, lai sasniegtu vai pārsniegtu ES vidējo rādītāju (34%) (European Commission 2024).

Mākslīgā intelekta izmantošana uzņēmumos visās trijās Baltijas valstīs ir zem ES vidējā rādītāja (8%), ar Igaunijā zemāko (3%) un Latvijā un Lietuvā nedaudz labāku (4%). Tas norāda uz nepieciešamību Baltijas valstīm investēt mākslīgā intelekta tehnoloģijās, lai palielinātu konkurētspēju un inovāciju līmeni (European Commission 2024).

Secinājumi

Apkopojot augstāk izklāstīto secināms, ka Baltijas valstis ir veikušas nozīmīgus soļus, lai kļūtu par pievilcīgām vietām *FinTech* uzņēmumiem. Analizējot politiskos, ekonomiskos, sociālos un tehnoloģiskos aspektus, ir acīmredzams, ka katrā valstī pastāv atšķirīgas priekšrocības un izaicinājumi. Igaunija ir izcēlusies ar spēcīgu digitālo infrastruktūru un e-pārvaldes sistēmu, kā arī ar visstabilāko un straujāko investīciju izaugsmi *FinTech* nozarē. Lietuva ir apliecinājusi savu vadošo pozīciju ar progresīvu regulējumu un plašiem atbalsta mehānismiem, Latvija, lai arī piedzīvojusi ievērojamu izaugsmi, saskaras ar zināmām grūtībām noturēt savas pozīcijas tirgū. *FinTech* nozares attīstība Baltijas valstīs ir būtiski veicināta arī pateicoties augsti kvalificētam darbaspēkam, labvēlīgiem nodokļu režīmiem un spēcīgai *startup* kultūrai. Aplūkotā informācija un analīze sniedz padziļinātu izpratni par katras Baltijas valsts specifiskajām tendencēm, kuras ir svarīgas, lai formulētu stratēģijas *FinTech* uzņēmumu tālākai izaugsmei un konkurētspējai globālā tirgū.

Visas Baltijas valstis ir aktīvi darbojušās, lai uzlabotu savu regulatīvo un uzraudzības vidi, bet jāatzīmē ka Lietuva ir panākusi īpašus rezultātus. Lietuva no 2019. līdz 2023. gadam ir sasniegusi gandrīz 30% pieaugumu jaunreģistrēto *FinTech* uzņēmumu skaita ziņā, salīdzinot ar Igauniju un Latviju. Lietuva piedāvā elektroniskās naudas iestādes (EMI) un maksājumu iestādes (PI) licences, kas ir pievilcīgas ar viegli pieejamām prasībām un ātru izsniegšanu, kā rezultātā aptuveni 50% no visiem *FinTech* uzņēmumiem Lietuvā ir saņēmuši šīs licences.

Lietuvas IKP ir pieredzējis strauju pieaugumu, no 54,81 miljardiem dolāru 2019. gadā līdz 70,97 miljardiem dolāru 2022. gadā. Šis straujais IKP pieaugums atspoguļo Lietuvas ekonomiskās attīstības spēju un pievilcību *FinTech* uzņēmumiem. Lietuvas nodokļu politika sekmējusi investīciju piesaisti, uzņēmumu ienākuma nodokļa stabilitāte (15% analizējamajā laika nogrieznī nemainīga) nodrošina fiskālo paredzamību un konkurētspējīgu vidi.

Digitālās ekonomikas un sabiedrības indeksa rezultāti atklāj būtiskas atšķirības Baltijas valstu tehnoloģisko sasniegumu līmenī. Igaunija 2023. gadā pēc DESI indeksa ieņēma augstu vietu starp ES valstīm digitālo tehnoloģiju integrācijā uzņēmumos un e-pakalpojumu pieejamībā, kas veido 85% no visiem pieejamajiem pakalpojumiem. Augstais rādītājs ir būtisks arguments *FinTech* uzņēmumiem izvēlēties Igauniju kā savu mītnes zemi, jo valsts sniedz efektīvu infrastruktūru un atbalstu tehnoloģiju integrācijai, kas ir kritiski svarīgi *FinTech* biznesam. Igaunijas augstais vērtējums publisko pakalpojumu digitalizācijā ne tikai uzlabo valsts administratīvo efektivitāti, bet arī nodrošina augstus standartus digitālās drošības un datu apstrādes jomā, kas ir izšķiroši *FinTeh* nozarei.

Latvija ir izvirzījusies priekšgalā attiecībā uz finanšu tehnoloģiju regulatīvo inovāciju, pateicoties tās progresīvajai pieejai datu aizsardzības un klientu privātuma garantēšanā. Latvija ir viena no pirmajām valstīm Baltijā, kas ieviesusi GDPR (vispārīgās datu aizsardzības regula) principus *FinTech* nozarē, nodrošinot augstākus datu aizsardzības standartus un paaugstinot patērētāju uzticību. Šis sasniegums ne tikai uzlabo klientu drošību un privātumu, bet arī veicina inovatīvu pakalpojumu attīstību un starptautisko uzticēšanos Latvijas finanšu tirgum.

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Fintech development trends in the Baltic States

Summary

The global FinTech industry is experiencing rapid growth, driven by the development of information technology, making financial services more accessible and efficient. Since 2019, FinTech companies have experienced rapid development worldwide, their number has more than doubled. In Latvia, FinTech companies account for a quarter of all Latvian startups (Fintech Pulse 2023), and among them are some of the most successful and fastest growing FinTech companies in Europe. Latvian financial sector companies are introducing and using innovations that improve customer experience and provide modern and convenient services to customers. The integration of technologies in the financial industry is not only necessary, but also inevitable in order to streamline financial processes and offer innovative products and services. Integration demonstrates the important role of technology and innovation in economic development, as these aspects are the basis for improving productivity and creating new economic opportunities. Comparing Latvia's progress with other European Union countries, it is clear that Latvia is currently lagging behind in technological development (Finanšu ministrija 2023). The topic of the article was chosen to understand what factors affect the growth and number of FinTech companies in Latvia, and the attractiveness of the country as a home for foreign financial technology companies. The aim of the article is to study and analyze the development of the FinTech sector in Latvia compared to other Baltic countries. The objectives of the study were: to study and assess the dynamics of FinTech development in Latvia compared to the development in the Baltic countries, to identify key trends and challenges, and to draw conclusions. In order to ensure the competitiveness and sustainable development of the Latvian FinTech sector, it is necessary to continue to develop and improve the regulatory environment, focusing in particular on the integration of new technologies and international cooperation. It is essential to invest in digital infrastructure and ICT education to improve local technological capacity and competitiveness. To reduce investment volatility, policies and instruments should be developed that ensure stability and attractiveness for investors, such as tax breaks and risk mitigation mechanisms. It is important to invest in and develop the state's digital infrastructure, ensuring stable and fast internet connectivity throughout Latvia, as well as supporting FinTech companies with modern security solutions.

Keywords: FinTech, banks, start-ups, new companies.

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THE COMPARATIVE ANALYSIS OF ECONOMIC FORECASTING METHODS ACCURACY BASED ON THE LATVIAN MACROECONOMIC INDICATORS DATA

The purpose of this paper is to perform a comparative analysis of the two forecasting methods' accuracy – Compound Annual Growth Rate (CAGR) and Singular Spectrum Analysis (SSA). The CAGR method is a forecasting method that is based on the compound interest rate formula. SSA was initially used for signal processing, but in 2001 scientists N. Golyandina, V. Nekrutkin and A. Zhigljavsky discovered the forecasting ability of this method. In this paper, we have performed the CAGR and SSA forecasts for the six main indicators of the Latvian economy – real GDP, households' final consumption expenditure, gross fixed capital formation, productivity, real GDP per capita, and population (total). The forecasts' accuracy was compared based on the Mean Absolute Percentage Error (MAPE) and according to the obtained results, the forecasts of the SSA have higher accuracy than the CAGR forecasts.

Keywords: economic forecasting, technical analysis, SSA, macroeconomics, Latvian macroeconomic indicators.

1. Introduction

Economic forecasting is a discipline with a long history of development. The origins of economic forecasting refer to ancient times – these forecasts were created based on the needs of agriculture, for instance, Ancient Egyptians forecasted the floods of the river Nile and the impacts of these floods on the harvest. The early attempts to "quantify" the forecasting of economic processes were described in the works of W. Petty (XVII century) – his main contribution is related to the observation of the 7-year business cycle, which later "provided the basis for systematic economic forecasts" (Hendry et al. 2019, p. 13).

The most rapid development of economic forecasting occurred in the XX century. Before the Great Depression, economic forecasting actively developed in the USA, for instance, see the business barometers by W. Petersons and compositplots by R. Babson (Hendry et al. 2019, p. 13). After the Great Depression, a new approach to the analysis of economic processes was proposed – macroeconomics (De Vroey 2016). In 1936, J. Tinbergen introduced the first macroeconometric model for the Netherlands economy (Dhaene, Barten 1989). In 1937, the IS-LM model (Investment-Savings, Liquidity-Money) was developed by H. Hansen, which is a formalized description of J. M. Keynes's "The General Theory" (De Vroey 2016). After World War II, in 1946, J. Marschak organized a special group at the Cowles Commission for macroeconomic model development (Valadkhani 2004). Since then the development of macroeconomic models evolved. Nowadays, the mainstream of macroeconomic models is DSGE (dynamic, stochastic, general equilibrium) models. These models are developed at all levels of the analysis of economic processes and require the use of numerical and computational methods for their solution (De Vroey 2016).

From the economic forecasting theory point of view, there are only two main approaches to the forecasting of economic processes – technical analysis and fundamental analysis. The main task of the technical analysis is to identify the patterns of the data based on the historical time series. The main task of the fundamental analysis is to perform the analysis of the factors that influence economic processes. Technical analysis refers to the time series analysis, fundamentals analysis refers to the analysis based on the economic models. The use of the appropriate forecasting method is a crucial step in a decision-making process, thus inaccurate forecasts might lead to financial losses and misconceptions in the implementation of the economic policy (Wilcox 2024).

In our paper, we have considered economic forecasting based on the technical analysis approach.

The purpose of our paper is to perform a comparative analysis of the two forecasting methods' accuracy – Compound Annual Growth Rate (CAGR) and Singular Spectrum Analysis (SSA). We have performed the CAGR and SSA forecasts, using the 1995 – 2023 time series data of the following indicators of the Latvian economy:

1) Real GDP (in the year 2020 prices),
2) Household's final consumption expenditure (in the year 2020 prices),
3) Gross fixed capital formation (in the year 2020 prices),
4) Real labor productivity per hour worked (in the year 2020 prices),
5) Real GDP per capita (in the year 2020 prices),
6) Population (total).

In the methodology section, we provide a detailed description of these forecasting methods.

2. Methodology

2.1. Compound Annual Growth Rate (CAGR)

CAGR describes the average growth rate of an indicator over a given period (see equation 1) (Khojasteh et al. 2023). It is a commonly used metric in economic forecasting – the CAGR forecasts correspond to the compound interest rate formula (see equation 2) (Chan 2009).

$$g = \sqrt[n]{\frac{x_n}{x_0}} - 1 \tag{1}$$

where:
g – compound annual growth rate,
n – number of years,
x_n – final value,
x_0 – beginning value.

$$CAGR\ forecast = x_0(1+g)^n \tag{2}$$

Table 1 contains the calculated CAGR for the 6 main indicators of the Latvian economy based on the data from years 1995 to 2023.

Table 1

CAGR of the analysed indicators (years 1995-2023)

No	Indicator	CAGR
1	Real GDP	3.49%
2	Household's final consumption expenditure	3.17%
3	Gross fixed capital formation	5.98%
4	Real labor productivity per hour worked	4.08%
5	Real GDP per capita	4.49%
6	Population (total)	-0.95%

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

From the obtained results, it is obvious, that the gross fixed capital formation has got the highest growth rate (5.98%) compared to other indicators. The population has the lowest growth rate among the analysed indicators (-0.95%). In general, it can be concluded from the results in Table 1, that real GDP "grows slower" than the gross fixed capital formation and productivity, and the population declines over time. The growth rates obtained in Table 1, were used for the indicators' six-year ahead projections. For the validation forecasts, we have calculated the CAGR of the indicators for the years 2013-2023 (see Table 2).

Table 2

CAGR of the analysed indicators (years 2013 - 2023)

No	Indicator	CAGR
1	Real GDP	2.13%
2	Household's final consumption expenditure	1.81%
3	Gross fixed capital formation	1.95%
4	Real labor productivity per hour worked	2.28%
5	Real GDP per capita	2.76%
6	Population (total)	-0.61%

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

In general, the main advantage of the CAGR method is its relative simplicity, however, this method assumes the linear growth of the indicators over time and does not consider the fluctuations of the time series. To improve the accuracy of the forecasts, other forecasting methods should be used. Nowadays, the most accurate forecasting method is SSA.

2.2. Baseline Singular Spectrum Analysis (SSA)

SSA is a non-parametric time series analysis method (Hassani 2010). Its origins are related to the Karhunen-Loeve theorem (KLT), which refers to signal extraction from noise (Giambartolomei 2015). The main principle of the SSA method is to decompose a time series and then reconstruct it. SSA decomposes the time series into three main components – trend, oscillations and noise (de Oliveira Santos et al. 2024).

In 1978, J. Colebrook used the principal component analysis for the analysis of zooplankton abundance (Colebrook 1978). Since then, SSA has been widely developed for of the identification and extraction of the time series low-frequency and high frequency components (Wei et al. 2022).

In 1986, Broomhead and King developed a multivariate version of SSA (MSSA) (Broomhead, King 1986). In 2001, N. Golyandina, V. Nekrutkin and A. Zhigljavsky identified the forecasting abilities of the SSA method (Golyandina et al. 2001). Nowadays, the SSA method is applied in various fields (e.g., energy, oceanology, finance, economics, and medical diagnostics) and has different variations, for instance, Circulant SSA (CiSSA), multivariate circulant SSA (MCiSSA) (Bógalo et al. 2024).

In our paper, we use the baseline SSA method. The baseline SSA consists of four main steps – data embedding, singular value decomposition, grouping, and reconstruction. Below each of these steps is described briefly (Hassani 2010; de Oliveira Santos et al. 2024):

1) Data embedding.

The time series, with the embedding parameter L (windows length), is transformed into the trajectory matrix X, which is the Hankel matrix (see equation 3).

$$X = \left(x_{ij}\right)_{i,j=1}^{L,K} = \begin{pmatrix} f_0 & f_1 & f_2 & \cdots & f_{K-1} \\ f_1 & f_2 & f_3 & \cdots & f_K \\ f_2 & f_3 & f_4 & \cdots & f_{K+1} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ f_{L-1} & f_L & f_{L+1} & \cdots & f_{N-1} \end{pmatrix} \quad (3)$$

2) Singular value decomposition (SVD).

The singular value decomposition (SVD) divides the matrix X into a series of elementary matrices (matrix with rank 1). To perform the SVD, the product of trajectory matrix X and its transposed matrix must be calculated, $S = X \cdot X^T$. The matrix S is decomposed into eigenvalues and eigenvectors.

3) Grouping.

The obtained series of elementary matrices are divided into several groups, which corresponds to $X_I = X_{i,1} + \cdots + X_{i,l}$. At this step, the time series is transformed into additively separate components – trend, oscillations and noise.

4) Reconstruction.

The reconstruction of the time series refers to the diagonal averaging – the trajectory matrix is transformed into a time series (see equation 4).

$$g_k = \begin{cases} \dfrac{1}{k+1} \displaystyle\sum_{m=1}^{k+1} y^*_{m,k-m+2} & for\ 0 \le k < L^* - 1, \\ \dfrac{1}{L^*} \displaystyle\sum_{m=1}^{k+1} y^*_{m,k-m+2} & for\ L^* - 1 \le k < K^*, \\ \dfrac{1}{N-k} \displaystyle\sum_{m=k-K^*+2}^{N-K^*+1} y^*_{m,k-m+2} & for\ K^* \le k < N \end{cases} \quad (4)$$

The forecasting of the SSA is based on the linear recurrent formula (LRF, see equation 5). LRF stated that each subsequent element is expressed as a linear combination of previous elements. If we assume that the LRF is valid not only in the original time interval but also outside the interval, a time series forecast can be obtained.

$$f_n = a_1 f_{n-1} + \cdots + a_d f_{n-d} \quad (5)$$

In the next section, we describe the metric that was used for the forecasting accuracy comparison – MAPE (mean absolute percentage error).

2.3. Mean absolute percentage error (MAPE)

We have used the MAPE metric (see equation 6) to compare the forecasting accuracy of the CAGR and SSA forecasting accuracy. MAPE stands for mean absolute percentage error and it describes the average percentage error between the actual and forecasted data (Taylor 2022).

$$\text{MAPE} = \frac{\sum\left(\left|\frac{x - \hat{x}}{n}\right|\right)}{n} \cdot 100 \quad (6)$$

where:
x – actual data,
$\hat{x}$ - forecasted data,
n – number of observations.

The MAPE was applied for the validation forecasts of CAGR and SSA, which are described in the next section of the article.

3. Results

3.1. Validation forecasts

To evaluate the accuracy of each forecasting method, we have performed the validation forecasts according to the following principles:

1) In the case of the SSA forecasts, the time series was divided into two main intervals – optimization interval and testing interval. The optimization interval refers to the years 1995-2012, and the data of this interval is the basis for the forecast. The testing interval refers to the years 2013-2023 and is "the forecast" for the method.
2) In the case of the CAGR forecasts, the annual growth rates were calculated for the years 2013-2023 (see Table 2). These growth rates were taken as a base for indicators forecasting – the beginning values of all indicators were set to their values in the year 2012.

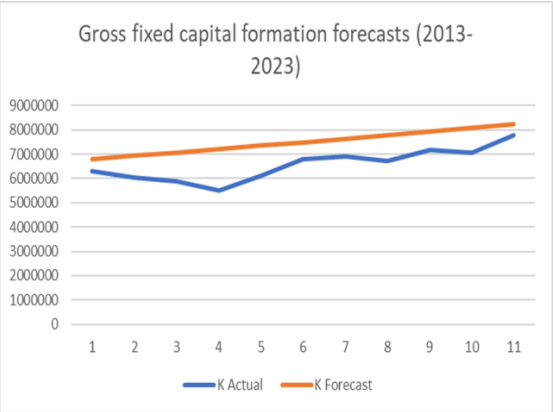
Table 3

Calculated MAPE of the indicators' validation forecasts

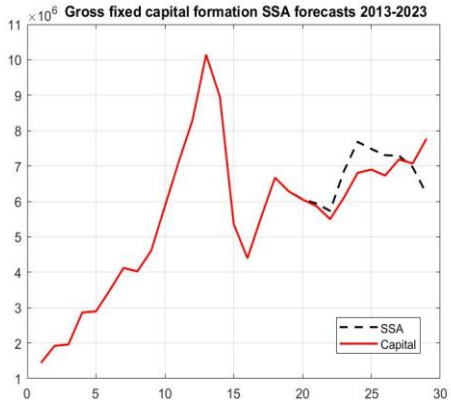
No	Indicator	Notation	MAPE SSA	MAPE CAGR
1	Real GDP	Y	2.13%	1.89%
2	Household's final consumption expenditure	C	1.81%	5.68%
3	Gross fixed capital formation	K	6.43%	14.73%
4	Real labor productivity per hour worked	Y/L	1.66%	0.48%
5	Real GDP per capita	Y/P	3.16%	3.21%
6	Population (total)	P	0.25%	1.36%

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

According to the obtained results in Table 3, it is obvious that SSA forecasts have higher accuracy than CAGR forecasts. For all six indicators, the average value of MAPE is 2.57% for the SSA forecasts, and 4.56% for the CAGR forecasts. The least accurate forecasts were obtained for the gross fixed capital formation (see Fig. 1).



(a) CAGR forecast



(b) SSA forecast

Figure 1. **Gross fixed capital formation validation forecasts**

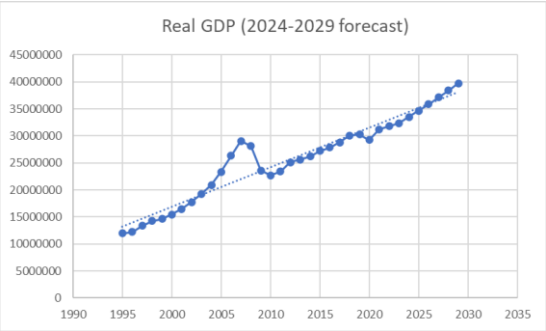
Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

Figure 1 describes the gross fixed capital formation validation forecasts. The forecasts of both methods were inaccurate – both CAGR and SSA forecasted higher values of the gross fixed capital than the actual values. In the case of the SSA forecast, the method also forecasted the decline of the indicator's values, which was not obtained in the actual data.

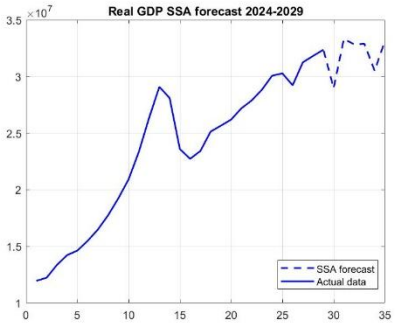
After the evaluation of both forecasting methods' accuracy, we have performed the six years ahead forecasts of all six indicators.

3.2. Six years ahead forecasts

We have performed the six years ahead forecasts (2024 – 2029) of all six indicators. For the CAGR six years' ahead forecasts, we have used the indicators' growth rates, calculated based on the years 1995 – 2023 data (see Table 1). The results are described in the figures below.



(a) CAGR forecast



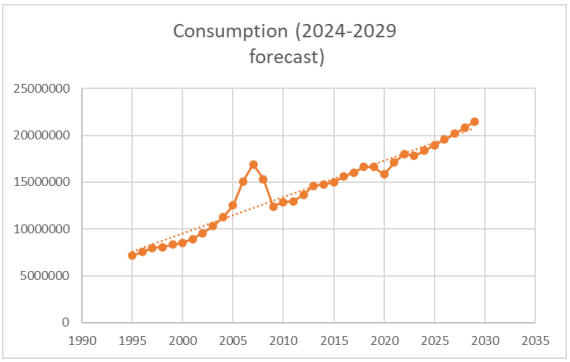
(b) SSA forecast

Figure 2. **Real GDP forecasts**

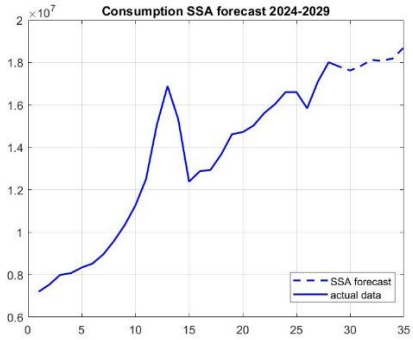
Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

Figure 2 describes the forecasts of the Real GDP. As it is obvious from the forecasting graphs, both methods "predict different scenarios" for the real GDP – the

CAGR forecasts the growth of the indicator, while SSA forecasts the fluctuations. According to the SSA forecasts, the major declines of the Real GDP were obtained by 2024 and 2027.



(a) CAGR forecast

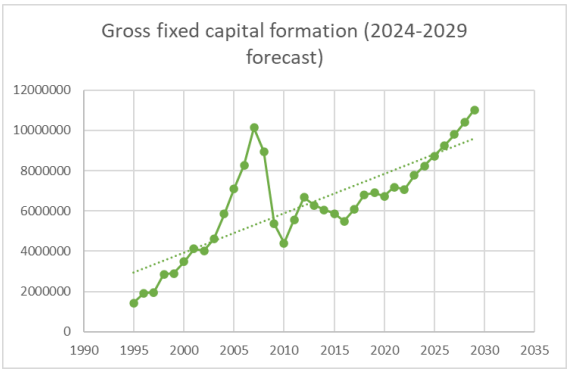


(b) SSA forecast

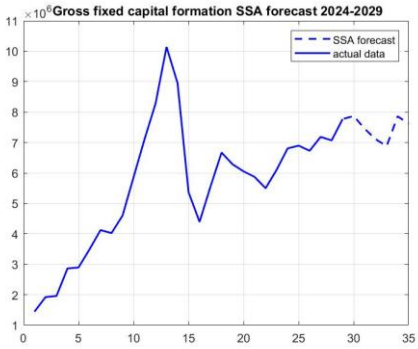
Figure 3. **Consumption forecasts**

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

Figure 3 describes the households' consumption forecasts six years ahead. In general, both CAGR and SSA forecast an increase in consumption, however SSA "predicted" a slight decline in consumption in the year 2024.



(a) CAGR forecast

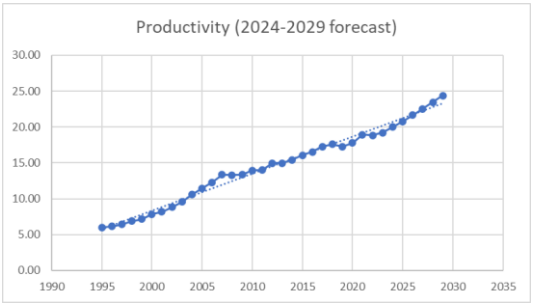


(b) SSA forecast

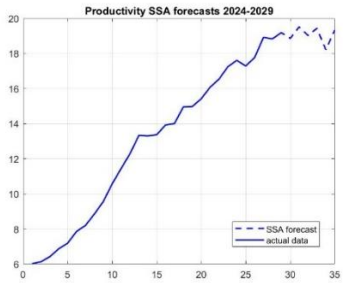
Figure 4. **Gross fixed capital formation forecasts**

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

Figure 4 describes the six-year ahead forecasts of the gross fixed capital formation. In general, the CAGR forecasts significantly higher values of the capital rather than SSA. SSA even forecasts the decline of the gross fixed capital formation during years 2024 - 2026, which is not obtained in the case of CAGR forecasts.



(a) CAGR forecast

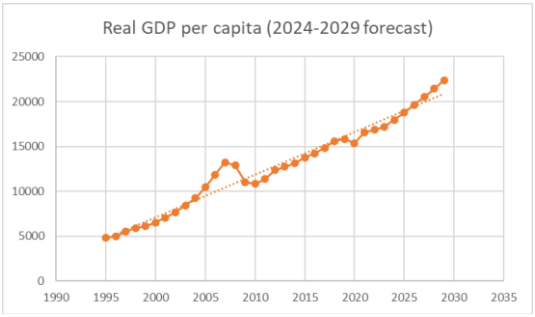


(b) SSA forecast

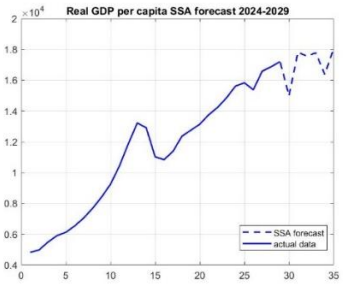
Figure 5. **Productivity forecasts**

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

Figure 5 describes the six-year ahead forecasts of productivity. According to the obtained results, the difference between CAGR and SSA forecasts is obvious – CAGR forecasts a stable growth of productivity over time, while SSA forecasts the fluctuations of productivity.



(a) CAGR forecast

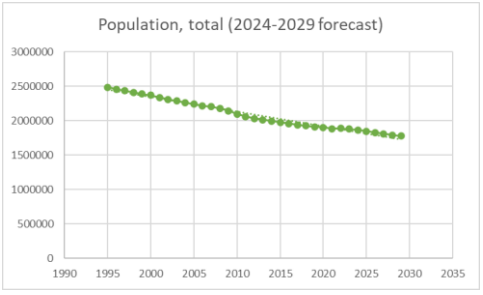


(b) SSA forecast

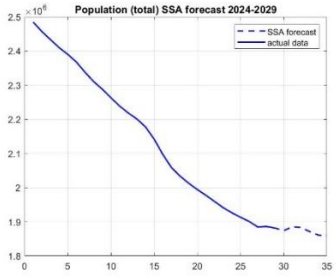
Figure 6. **Real GDP forecasts**

Source: Made by the authors based on data from Oficiālais statistikas portals (2024 a, b, c, d).

Figure 6 describes the six-year ahead forecasts of real GDP. The “general picture” is the same as in the case of the real GDP – the CAGR forecasts the growth of the indicator, while SSA forecasts the fluctuations of the indicator.



(a) CAGR forecast



(b) SSA forecast

Figure 7. **Population (total) forecasts**

Source: Made by the authors based on data Oficiālās statistikas portals 2024 a, b, c, d.

Figure 7 describes the population (total) six-year ahead forecasts. Both CAGR and SSA forecast the decline of the population over time.

To sum up, the CAGR and SSA methods have different principles of forecasting, thus this explains the different behaviour of the indicators in the case of CAGR and SSA forecasts. CAGR assumes the continuous growth of the indicators over time, while SSA replicates the previous time series patterns into the future. If we take into consideration the MAPE indicator, SSA forecasts are more accurate than CAGR forecasts.

At the end of the paper, the conclusions are provided.

Conclusions

1. In our paper, we have performed a comparative analysis of two forecasting methods accuracy – CAGR and SSA. Both methods refer to the technical analysis approach, which is solely based on historical data analysis. We have performed our forecasts for the six main indicators of the Latvian economy – real GDP, real GDP per capita, gross fixed capital formation, consumption, productivity and total population.
2. First, we have performed the validation forecasts of the abovementioned indicators with both methods – the accuracy of both methods was compared based on MAPE. The validation forecasts showed, that the SSA forecasts had higher accuracy than CAGR forecasts. However, CAGR validation forecasts were more accurate in the case of the real GDP and productivity. The data series of these indicators "resemble linear process".
3. Second, we have performed the six-years ahead (years 2024 – 2029) forecasts of all six indicators. Based on the specifics of CAGR and SSA, different forecasts were obtained. CAGR six-years ahead forecasts of all indicators were significantly greater than their trend. On the opposite, SSA predicted the fluctuations of all six indicators, the most evident fluctuations were obtained in the case of the Real GDP, gross fixed capital formation and productivity.
4. It is important to perform the analysis of these six indicators based on fundamental analysis. The main drawback of the technical analysis approach is that it does not explain the impact of the factors on the economic processes. The further steps might be to perform the regression analysis of these six indicators or to perform the analysis of Latvian economic processes based on the DSGE model.

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Ekonomiskās prognozēšanas metožu precizitātes salīdzinošā analīze uz Latvijas makroekonomisko rādītāju datiem

Kopsavilkums

Raksta mērķis ir veikt divu prognozēšanas metožu – saliktais gada pieauguma temps (CAGR) un Singulārā Spektrālā Analīze (SSA) – precizitātes salīdzinošo analīzi. CAGR metode ir prognozēšanas metode, kuras pamatā ir saliktās procentu likmes formula. SSA sākotnēji tika izmantota signālu apstrādei, bet 2001. gadā zinātnieki N. Goļandina, V. Nekrutkins un A. Žigļavskis atklāja šīs metodes prognozēšanas spēju. Šajā rakstā mēs veicām CAGR un SSA prognozes sešiem galvenajiem Latvijas ekonomikas rādītājiem – reālajam IKP, mājsaimniecību galapatēriņa izdevumiem, bruto pamatkapitāla veidošanai, produktivitātei, reālajam IKP uz vienu iedzīvotāju un iedzīvotāju skaitam (pavisam). Prognožu precizitāte tika salīdzināta, pamatojoties uz VAPK (vidējā absolūtā procentuālā kļūda), un saskaņā ar iegūtajiem rezultātiem SSA prognozēm ir augstāka precizitāte nekā CAGR prognozēm.

Atslēgas vārdi: ekonomiskā prognozēšana, tehniskā analīze, SSA, makroekonomika, Latvijas makroekonomiskie rādītāji.

Akbar Huseynov (Latvia)

OPTIMIZING THE EFFICIENCY OF THE USE OF AIR TRANSPORT IN THE DEVELOPMENT OF HOTEL BUSINESS IN THE REGIONS OF AZERBAIJAN

Due to the closure of land borders in Azerbaijan since 2020, all enterprises operating in the tourism sector have the option of using air transport as the only alternative way of doing business. In particular, the failure to take certain necessary steps towards visa simplification between Azerbaijan and the European Union, the fact that the government and all tourism enterprises operating in the private sector do not carry out a planned long-term business strategy regarding the attraction of tourists from Europe to the country, create obstacles in the development of the hotel business in Azerbaijan. During the research, the importance of implementing optimal measures to increase the efficiency of air transport in the development of the hotel business in Azerbaijan will be noted, and certain suggestions and recommendations will be given by the author for specialists conducting research in the tourism sector. In the study, comparative-statistical analyzes will be conducted for air transport, the general tourism sector, domestic tourism, hotel business, as well as individual tourism sectors in Azerbaijan during the last 10 years. During the study, all indicators were systematically and consistently examined and a quantitative method was used. For the certain sections of the study, the author applies analysis-synthesis and induction-deduction methods. In the conducted research, the relevance of the theme will be justified by the author, the main goals of the research will be mentioned. The scientific and practical significance of the researched topic will be explained by the author and will be completed with results and suggestions after econometric analysis. The scientific results obtained at the end of the research will be useful for economists studying the hotel and innovation business in Azerbaijan and Latvia.

Keywords: domestic air transport, business strategy, comparative analysis, health tourism, hotel business, passenger transportation.

Introduction

Azerbaijan, which declared its independence in 1991, began to take serious steps towards the development of the tourism sector and an economic policy aimed at increasing the share of tourism revenues in the non-oil sector (Hashimli 2019). Until then, the government had only set the goal of the rapid development of the oil and gas sector, and a number of legal and international agreements (for example, the "Contract of the Century" signed on September 20, 1994 for the purpose of attracting foreign investments in the oil and gas sector played an important role) (The Ministry of Energy of the Republic of Azerbaijan 2023). Most of them were directed to this field. The share of the oil and gas sector in the country's gross domestic product exceeded 90 percent and the active use of depleted resources revealed the importance of the government paying attention to the development of the non-oil sector.

While the initial state programs for the development of the alternative energy sector were being prepared on the one hand, on the other hand, decisions were made to bring Azerbaijan's rich flora and fauna, geographical location, historical-architectural monuments, unique cuisine, various beaches of the Caspian Sea coast and favorable subtropical climate to the forefront of the tourism sector. Through the "2002-2007 State Program for the Development of Tourism in Azerbaijan" (OSCE 2004; Presidential Library of Azerbaijan 2016) and the "Strategic Road Map" (The Ministry of Finance of the Republic of Azerbaijan 2016; Food and Agriculture Organization of the United Nations 2023) signed in 2016, Azerbaijan opened a new stage in the development of tourism (State Tourism Agency of Azerbaijan 2023). At this stage, airline companies began to play a key role in attracting the flow of tourists to the country. The increase of international flights to Baku International Airport created fertile conditions for the development of the hotel business in the country and also increased the role of tourism companies. On the other

hand, rich tourism important regions in the country located far from the capital (mainly with favorable conditions for the development of mountain and health tourism) today have a small share of the country's budget income as a result of poor development of air transport, lack of international flights, weak marketing and promotion policy. For these reasons, the main purpose and importance of investigating this problem in the research should be mentioned separately.

Aim and significance of the research

The main goal of the study is to review the possibilities of optimizing the efficiency of air transport and exploring innovation orientation in the development of hotel business in separate tourism-important regions of Azerbaijan. There are many factors that reveal the importance of research. Firstly, although there are favorable conditions for the development of mountain tourism in Azerbaijan, tourist access to the regions is poorly developed. Despite the fact that the Shahdag skiing complex located in the north of the country is ready to provide basic services for those who prefer winter tourism in the area where it is located, the absence of international airports or flights in the northern part of the country, the low quality of bus transport for passengers, the low quality, cost and low speed of railway transport, and it is obvious that sea transport is not functioning at all.

Secondly, while international flights are carried out in some regions, domestic and foreign tourists are deprived of the service provided in hotels, restaurants and museums, the fantastic price of air tickets, and the unfair competition of airlines serving low-budget passengers by Azerbaijan Airlines, and this problem also affects their travel opportunities. Complaints about the restriction are constantly increasing.

Thirdly, while there are potential opportunities for the development of health tourism, necessary measures are not taken in the development of the hotel business in the regions of the country. There are very few regions in the world where natural healing oil-mud baths are spread. Although the city of Naftalan, located in the western region of Azerbaijan, is located close to the Ganja International Airport, the tourist facilities, hotels and sanatoriums operating there suffer from the lack of foreign tourists. The limited numbers of international flights from Ganja airport, weak marketing and promotion of Naftalan sanatoriums for foreign tourists, and at the same time the fact that Baku-Ganja high-speed railway transport does not show the expected positive results directly affect all processes.

Fourthly and finally, the closure of land borders in Azerbaijan since March 2020 (Talibadze, Geybullayeva 2024) has had a negative impact on the effective operation of tourism facilities operating in the country and, most importantly, in the border areas. Before the pandemic, the majority of foreign tourists were from neighboring countries, and land transport and, most importantly, road transport were in active use. However, since the only way for foreign tourists to come to Azerbaijan is air transport, Azerbaijan Airlines, the main airline of the country, has expanded its market opportunities under the current conditions. As a result of increase in ticket prices, dissatisfaction with the day-by-day decreasing number of tourists in tourist facilities operating in the capital and regions has increased.

These or other processes directly show once again the importance of research.

The main tasks and problems of the research

The main tasks set in the conducted research are as follows:

- Comparative analysis of the impact of the annual number of foreign tourists coming to Azerbaijan on macroeconomic indicators

- Comparative-statistical analysis of a number of important economic indicators (number of people accommodated in hotels, income and expenses of tourist facilities, income and expenses of tour operators and travel agents) that express the current situation of the tourism sector in Azerbaijan
- Comparative-statistical analysis between annual passenger turnover, revenues and expenses from passenger transportation through air transport and GDP per capita in Azerbaijan.
- Final analysis of the main factors affecting the development of the hotel business in the regions of Azerbaijan, ways of implementing optimal opportunities.

The main problems encountered in the research work are as follows:

- The majority of tourism enterprises in Azerbaijan often do not publish their annual reports on their websites, and the statistical indicators obtained from this sector are obtained from the official website of the State Statistics Committee.
- In the field of tourism development in individual regions of Azerbaijan, potential proposals are not made by travel agents and tour operators to state institutions, or an ineffective action plan is prepared. The lack of official information about potential proposals hinders the diversification of research work.
- Keeping the current steps that will specifically affect the service level of hotels in the development of the hotel business in the regions with rich natural resources in Azerbaijan, makes long-term forecasting in the research work sometimes impossible.

The role of air transport in the development of hotel business in the regions. Application of optimal opportunities to ensure efficiency

Before the pandemic in Azerbaijan, the special weight of car transport was greater in the development of the hotel business and the flow of foreign tourists to the country. However, after the closure of land borders by the government in March 2020, the role of air transport has become the only option for tourism enterprises. In general, passenger transportation by air was over 700,000 in 2000, and in 2007, this figure doubled to 1,526,000. Before the pandemic, passenger transportation in 2019 was close to 3 million, but the following year this number decreased to 578 thousand people. In 2023, it returned to the previous level, officially surpassing 2019 statistic (Figure 1) (The State Statistical Committee of the Republic of Azerbaijan 2023c).

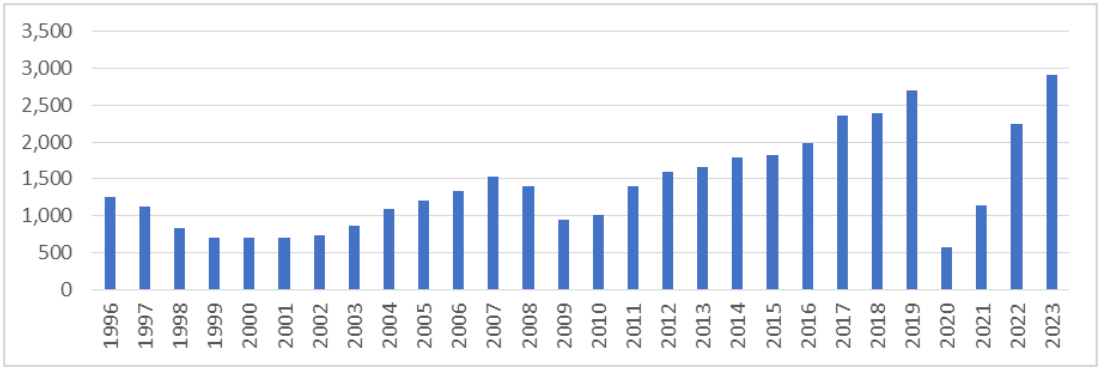

Figure 1. **Annual passenger transportation in Azerbaijan (thousand passenger)**

Source: The State Statistical Committee of Azerbaijan (2023c).

In fact, in 1996-1998, revenues from annual passenger transportation by air transport far exceeded costs. However, later this trend began to reverse. Especially during the years 2009-2011 and 2017-2018, serious differences began to be recorded. In 2019, revenues approached expenses, but the following year the balance was disrupted again. Last year, for the first time in a long time, revenue from air passenger transport exceeded costs (Figure 2) (The State Statistical Committee of the Republic of Azerbaijan 2023a).

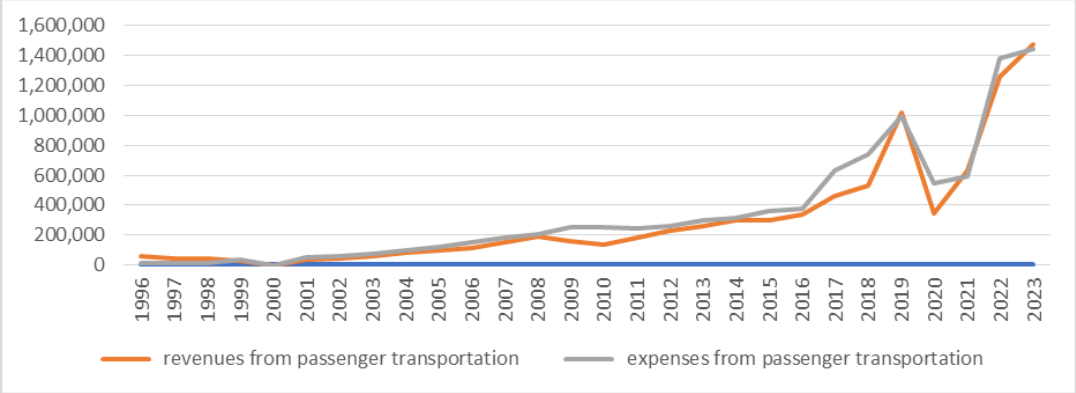

Figure 2. **Revenues and expenses from annual passenger transportation in Azerbaijan (thousand AZN)**

Note: 1 EUR = 1.85 AZN (at December, 2023).
Source: The State Statistical Committee of Azerbaijan (2023a).

The number of tourists accommodated in hotels and hotel-type establishments exceeded 500,000 in 2012 and 1 million in 2016. Although this figure approached 2 million in 2019, it declined rapidly during the pandemic. Based on last year's statistics, it can be safely said that at the end of 2024 this number will be close to 2.5 million people (Figure 3) (The State Statistical Committee of the Republic of Azerbaijan 2023a).

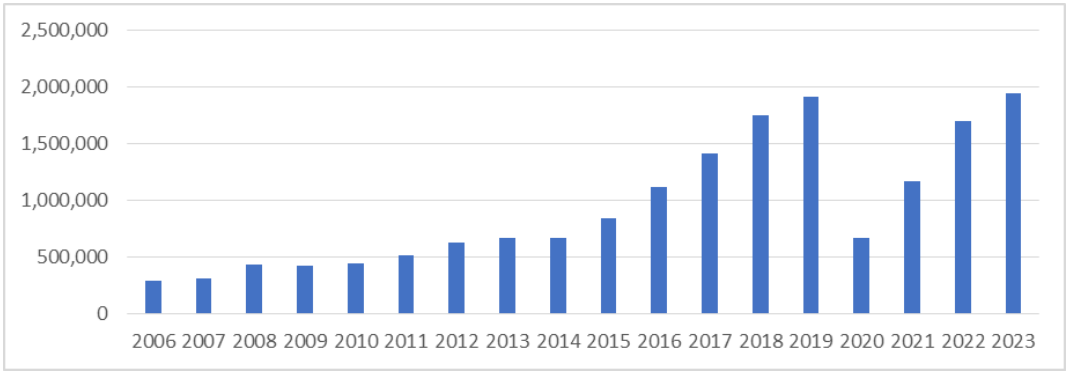

Figure 3. **Annual number of tourists accommodated in hotels and hotel-type establishments in Azerbaijan**

Source: The State Statistical Committee of Azerbaijan (2023a).

This research, based on comparative statistical analysis, shows that air passenger transport has a certain role in the development of the hotel business, but it has a moderate

impact compared to the annual GDP per capita (Figure 4) (The State Statistical Committee of the Republic of Azerbaijan 2023b).

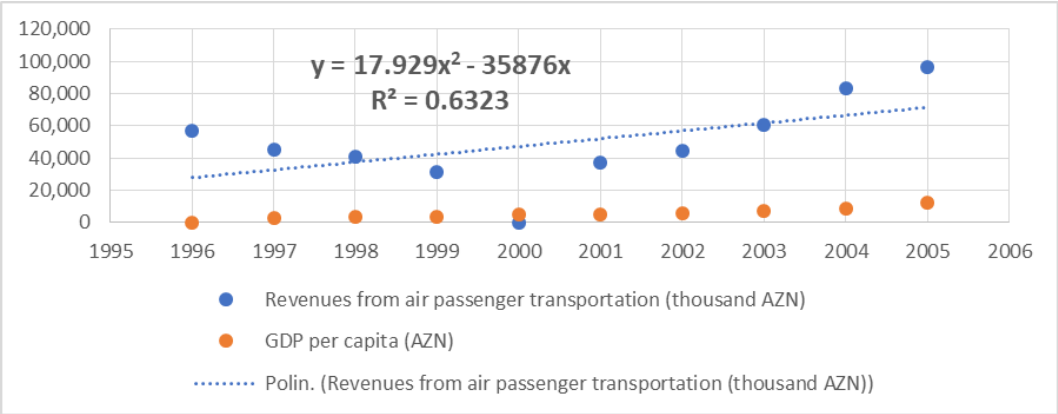

Figure 4. **Comparative analysis of annual revenues from air passenger transportation with GDP per capita in Azerbaijan**

Source: The State Statistical Committee of Azerbaijan (2023b).

Considering the expansionary fiscal policy in Azerbaijan is supported by the contractionary monetary policy, during the econometric calculations in the study, the level of regulation of the economy in tourism, Travel and Tourism Development Index and its sub-indicators were used as the basis for calculations (World Economic Forum 2024).

Table 1

The level of dependence of the total income of enterprises operating in the hotel business in Azerbaijan on the Travel and Tourism Development Index

	Azerbaijan
R^2	0,78912553
Standard error	688.032
T statistic	-4,810422169
P value	0,002917
Durbin-Watson coefficient	0,53776
The number of observations	10

Note: data for the time from 2013 to 2023.
Source: Calculation has been done by author via Eviews12 using The State Statistical Committee of Azerbaijan 2023a.

As a result of the econometric analysis, the increase of the Tourism Index in Azerbaijan has a serious effect on the increase of the income of the subjects operating in the hotel business.

Conclusion and suggestions

As a result of the research, the following conclusion was made:

- Econometric calculations show that the increase in the potential use of air transport in the tourism sector in a competitive environment directly affects the increase in the quantity of the international tourism index.

As a result of the research, the following suggestions were made:

- In the development of the hotel business in Azerbaijan, and most importantly, the development of tourism enterprises in the regions, it is imperative to open land borders. The opening of land borders can improve tourism potential in remote regions.
- There are wide opportunities for the development of health tourism in the western regions of Azerbaijan. In order for domestic and foreign investors to invest in this sector, these measures should be implemented consistently: liberal tax reforms should be carried out, licenses in the tourism sector should be simplified, hotels and sanatoriums should be certified according to international standards, and the level of customer service should be improved.
- International indicators in the tourism sector should be re-evaluated, a comprehensive action plan should be prepared by tourism enterprises. Azerbaijan's position on Travel and Tourism Development Index as well as 5 sub-indicators (Enabling environment, T&T policy and enabling conditions, Infrastructure and Sevices, T&T resources and T&T sustainability) affecting it should be improved. Especially at this moment, the sub-indicators of air transport and ground/port infrastructure in the category of Infrastructure and Services should be in the focus of attention of business subjects.

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Gaisa transporta izmantošanas efektivitātes optimizēšana viesnīcu biznesa attīstībā Azerbaidžānas reģionos

Kopsavilkums

Sakarā ar Azerbaidžānas sauszemes robežu slēgšanu kopš 2020. gada visiem tūrisma nozares uzņēmumiem ir iespēja izmantot gaisa transportu kā vienīgo alternatīvo uzņēmējdarbības veidu. Nespēja veikt nepieciešamos pasākumus vīzu vienkāršošanai starp Azerbaidžānu un Eiropas Savienību, kā arī valdības un privāto tūrisma uzņēmumu ilgtermiņa biznesa stratēģiju tūristu piesaistīšanai no Eiropas neīstenošana rada šķēršļus viesnīcu biznesa attīstībai Azerbaidžānā. Pētījuma laikā tiks atzīmēta optimālu gaisa transporta efektivitātes paaugstināšanas pasākumu ieviešanas nozīme viesnīcu biznesa attīstībā Azerbaidžānā, kā arī tiks sniegti atsevišķi autora ieteikumi speciālistiem, kas veic pētījumus tūrisma nozarē. Pētījumā tiks veikta salīdzinošā statistiskā analīze par gaisa transportu, iekšzemes tūrismu, tūrisma sektoru un atsevišķām tūrisma nozarēm, viesnīcu biznesu Azerbaidžānā pēdējo 10 gadu laikā. Dažās pētījuma sadaļās tiek pielietotas analīzes-sintēzes un indukcijas-dedukcijas metodes. Rakstā tiek pamatota pētījuma aktualitāte, noteikti galvenie tūrisma attīstības mērķi. Autors izskaidro pētītās tēmas zinātnisko un praktisko nozīmi un pēc ekonometriskās analīzes piedāvā secinājumus un priekšlikumus. Pētījuma noslēgumā iegūtie zinātniskie rezultāti būs noderīgi ekonomistiem, kuri pēta viesnīcu biznesu un inovācijas Azerbaidžānā un Latvijā.

Atslēgas vārdi: iekšzemes gaisa transports, biznesa stratēģija, salīdzinošā analīze, veselības tūrisms, viesnīcu bizness, inovācijas, pasažieru pārvadājumi.

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FACTORS AND MECHANISMS FOR INTRODUCING INNOVATIONS IN UKRAINIAN AGRICULTURAL ENTERPRISES DURING THE WAR AND THEIR PROSPECTS IN THE POST-WAR PERIOD

The subject of the article is to substantiate the importance of innovations for the functioning and competitiveness of agricultural enterprises in Ukraine during the war and for post-war recovery, to identify opportunities, threats and priorities for their implementation. The purpose of the article is to identify the most significant factors and vectors influencing innovations in agricultural enterprises, explore opportunities to mitigate negative and threatening factors, and focus on leveraging favorable conditions to substantiate the most crucial innovations for preserving employees and enterprises during the war and ensuring their competitive development in the future. The study used modern scientific approaches and methods: system-structural analysis and synthesis – to present innovations as a system with a certain structure and types of components, interrelationships and impact on the efficiency of agricultural enterprises, including synergistic; abstract-logical, monographic – to determine the stages and features of introducing innovations into agricultural enterprises to identify the sequence and use in rationalising the current stage. The research has shown that innovations play a key role in increasing the productivity of resources and production efficiency of agricultural enterprises and ensuring their competitiveness in agricultural markets. They bring significant benefits to consumers by increasing the quality and improving the nutritional and taste properties of food. It is established that in the context of war, these traditional functions are complemented by the most important function for people's lives – the function of security in demining territories, carrying out field work, calculations, management, training and retraining of specialists and personnel; ensuring logistics and sales of products. It is determined that in times of war, the demand for and the need for innovations increase, while the opportunities for implementation, especially financial and investment opportunities in Ukraine, are sharply reduced. It has been found that another important problem for the country over the years is the uneven access to innovations and other opportunities for implementation for small, medium and large enterprises; a sharp difference between them in terms of innovation. In other words, we are talking about the structure of agriculture with high-tech innovative agricultural holdings and more traditional small and medium-sized enterprises. The article identifies the lack of social responsibility, inclusion in the implementation of innovations, and social and environmental innovations. The authors also summarise the country's great innovation potential and its competitive advantages in the European and global context: a well-developed IT sector, digital ecosystem and digital governance; concentration of a large number of highly qualified information and digital technology specialists; and comprehensive state support for IT and digital technologies. It is concluded that all types of innovations of high technological modes are possible and can be implemented in Ukraine; their advantages and management mechanisms are described. The authors point out the need to attract international grants and donor funds to invest in innovations to restore the agricultural sector; to ensure security; to develop new types of activities; to solve the problems of the demographic crisis, housing reconstruction and other social problems of the rural population. In the long term, innovative tillage techniques and technologies; biotechnology; digitalisation of business processes and management; and digital marketing will remain important. It is necessary to provide for measures to support the development of the innovation process in small and medium-sized enterprises, including on the basis of public-private partnerships.

Keywords: innovation, agricultural enterprises, threats of war, biotechnology, diversification, social support, environmentalisation.

Statement of the problem

In recent decades, innovations and their implementation have become a real trend in the development and competitiveness of agricultural enterprises in Ukraine and in the world. This is evidenced by the publications of leading scientists of the country and the world, as well as practical experience. For example, O. Zakharchuk considers innovative support for agriculture to be one of the decisive factors in the state's food security (Zakharchuk 2020). A similar point of view is held by Y. Lupenko, A. Sitkovska and co-

authors. They define technical innovations of agricultural enterprises as an important factor in increasing competitiveness (Lupenko et al. 2017; Sitkovska et al. 2022). Representatives of agribusiness also emphasise the urgent need for innovation as a key to increasing its efficiency, specifying their types and effects on production and productivity (Banakhovych, Nehoda 2021; SmartFarming 2018; Grantsense 2024). This is explained by the intensification of competition among producers in the global and national markets, on the one hand, and the ability of innovations to respond quickly to its challenges, radically changing approaches to ensuring productivity and efficiency. When integrated with the rational specialisation and diversification of activities, favourable natural conditions and resources of agricultural enterprises, they can significantly increase their competitive potential and ensure sustainable development and a healthy environment. Innovations, especially technical, technological and digital innovations, can address security issues and production risks in the extreme conditions of Russia's war against Ukraine.

On the other hand, the war has caused unprecedented losses and damage to the country's agricultural sector. Because of the war, there are virtually no public financial resources to directly support it. It is also necessary to identify the product, environmental and social effects of innovations alongside the economic ones, so that benefits in one area do not turn into losses or other negative consequences in another. Therefore, it is of great theoretical and practical importance to identify and assess the current conditions and sources of investment in Ukrainian agricultural enterprises and determine their strategic priorities for the future.

The purpose of the article is to identify the most significant factors and vectors of influence on innovations in agricultural enterprises, opportunities to overcome negative and threatening ones and to focus on the use of favourable ones to substantiate the most significant innovations for the preservation of employees and enterprises in the context of war and their competitive development in the future.

Analysis of recent research and publications

It should be noted that innovations in the agricultural sector and agricultural enterprises in particular are the subject of research by leading domestic scholars. Their works relate to the methodology of introducing innovations and their evaluation by A. Zahorodnii and Yu. Stadnytskyi (2000); G. Osovska and A. Feshhenko (2014): S. Pokropyvnyj and A. Novak (1997); investment support for innovation O. Yermakov, A. Tiurina and H. Kalashnikova, H. (2022); Yu. Lupenko and O. Zakharchuk (2018); M. Kisil (2015); V. Lavruk (2010) management of innovations and innovation projects M. Kopytko (2019); M. Ihnatenko, L. Marmul, I. Romaniuk (2023). However, it has had and continues to have a devastating impact on people's lives, the activities of businesses, government and local governments, including innovation. Therefore, this direct and indirect impact requires comprehensive study and consideration.

The functions of many types of innovations have also changed, especially technical and technological and digital ones with an emphasis or priority on protection against military risks and threats, and ensuring security, which was not the case before. Finally, the history of the development of the innovation process in Ukrainian agricultural enterprises is characterised by certain disproportions in terms of the size of enterprises; sources of their investment; state support mechanisms; timing of implementation; and the level of innovation of individual enterprises, industries and activities in the agricultural sector. However, innovation remains a key factor and resource for improving the efficiency and competitiveness of agricultural enterprises. This will be further facilitated by studying and solving the outlined range of these and other problems on a scientific basis.

The purpose of the article is to identify the most significant factors and vectors of influence on innovations in agricultural enterprises, the possibilities of overcoming negative and threatening ones, and to focus on using favourable ones to substantiate the most significant innovations for preserving employees and enterprises in the context of war and their competitive development in the future.

Summary of the main material

Before Russia's unprovoked attack, Ukraine's agricultural sector was developing at a high rate of 4.5-5% per year (European Parliament 2024). This, as well as the enormous resource potential, favourable agro-climatic conditions, well-founded specialisation of large agricultural holdings and corporations, and the development of small and medium-sized enterprises, allowed the country not only to successfully solve its own food problems but also to become a leading global food producer. In 2021, agriculture accounted for 10.9% of the country's GDP (European Parliament 2024); 2.5 million people were employed, or 14% of the total (European Parliament 2024). Its share in exports was 41%, and its value was $27 billion (European Parliament 2024). Before Russia's invasion, Ukraine supplied 50% of the grain reserves of the UN World Food Programme (WFP) (European Parliament 2024), the world's largest humanitarian organisation. Prior to the Russian invasion, Ukraine's share in global exports of sunflower oil was 50% or 1st place; barley - 18% or 2nd place; corn - 16% or 4th place; wheat - 12% or 5th place (European Parliament 2024).

As of 30 September 2024, Ukraine's losses from the war amounted to USD 1.164 trillion (Andrienko et al. 2024). Of these, the agricultural sector accounts for USD 83.1 billion (Andrienko et al. 2024).; energy - USD 43.1 billion (Andrienko et al. 2024).; transport - USD 38.8 billion (Andrienko et al. 2024). In addition to revenue losses, the country's economy incurs significant additional costs: $42 billion for demining (Andrienko et al. 2024); $22.4 billion for the housing sector (Andrienko et al. 2024); $13.4 billion for dismantling the destruction and removing waste (Andrienko et al. 2024); and $7.7 billion for restoring housing and utilities (Andrienko et al. 2024). Losses also cover other sectors and infrastructure: healthcare - $11.4 billion; education and science - $14.5 billion; culture, sports and tourism - $7.3 billion; financial sector - $4.3 billion (Andrienko et al. 2024). Digital infrastructure and the IT sector lost $19.3 billion (Andrienko et al. 2024). The assessment was carried out by analysts of the Kyiv School of Economics together with experts from the Ministry of Community Development, Territories and Infrastructure, other ministries; the National Bank of Ukraine with the support of the DTA project (Andrienko et al. 2024).

War has a direct impact on innovation processes. For example, disruption of supply chains and sales channels leads to losses and losses in the supply of raw materials, equipment and technologies, and complicates the implementation of innovative developments. Declining profits of agricultural enterprises lead to difficulties in attracting investment, which limits their financial and investment opportunities for innovation. Under extraordinary conditions, agricultural enterprises focus on survival rather than innovation, i.e., there is a change in priorities. This leads to less attention to R&D and innovation. War can also encourage agricultural enterprises to quickly adapt to negative changes through innovation. For example, this includes the introduction of new farming methods, the use of renewable energy sources, and ways to sell products. It should be borne in mind that the number and structure of consumers and their needs may change during the war. This will require agricultural enterprises to react quickly and introduce new products or services, i.e., the impact of consumers on innovation.

In implementing and managing innovations, it should be borne in mind that in Ukraine there are significant differences in the structure and scope of innovations at the level of small, medium and large agricultural enterprises. For example, small agricultural enterprises usually have limited financial resources, which reduces their ability to innovate. They often focus on simple and affordable technologies, such as organic farming methods or basic automated management systems. Innovations can be aimed at reducing costs and increasing productivity without significant capital investment. Medium-sized agricultural enterprises have more resources and can invest in medium-term innovation projects, such as the introduction of new tillage technologies, improved logistics, or participation in national and regional development programmes.

They can implement more complex innovations, such as precision farming systems, etc. Large agricultural enterprises usually have significant financial resources for innovation. They can introduce innovations of higher technological levels, such as automation and digitalisation of production processes, biotechnology, innovative organisational and management systems, internet marketing and cognitive sciences. Large agricultural holdings and agricultural corporations are usually more risk-averse and can afford to take risks. This allows them to invest in new, untested technologies and other innovations that can be profitable and ensure the efficiency and competitiveness of agricultural enterprises.

The structure of innovations varies depending on the size of agricultural enterprises. For example, in small agricultural enterprises, innovations are often a response to external factors, such as changes in the market or consumer needs. The structure of innovation is usually simple and focused on immediate needs. Medium-sized agricultural enterprises have a more structured approach to innovation, including quality management systems and market research. They often cooperate with universities and research institutions to introduce new technologies. Large agricultural enterprises usually have their own research departments or invest in research. They may actively participate in national and international programmes and collaborate with other enterprises to develop innovations.

The types of innovations also differ by farm size. Small agricultural enterprises often focus on social innovation and environmentally sustainable practices, such as organic farming, niche or craft production. This allows them to stay in favourable market segments. Medium-sized agricultural enterprises invest, as noted, in technological innovations, management systems, and marketing innovations to improve the promotion of their products. Large agricultural enterprises mainly focus on integrated technological innovations, automation, biotechnology and new management systems. They are also innovating in logistics and supply chain management.

Different sized agricultural enterprises perceive the risks of innovation differently. Smaller farms are the most cautious about innovating due to limited resources. They may be more conservative in their approach, avoiding significant risks. Medium-sized agricultural enterprises have the opportunity to experiment with innovations, but large investments in innovations should be made only on the basis of preliminary calculations. Large agricultural enterprises are usually willing to take more risks because they have the ability to compensate for possible losses. They can afford to innovate, even if it leads to temporary losses.

Thus, the differences in the structure and volume of innovations at the level of small, medium and large agricultural enterprises are quite significant. These differences are due to financial capacities, management structure, types of innovation, and attitudes to risk. Understanding these aspects is important for developing effective strategies for innovation in the agricultural sector, ensuring equal access to innovation and government support for small enterprises as the ones that need it most.

To this end, attention should be paid to organisational innovations. They include information changes and simplification of access to information; digitalisation of document flow, digital administration, including in terms of obtaining grants for innovation. The introduction of new management structures also provides greater flexibility in decision-making. Optimisation of business processes, including the introduction of quality management systems such as International Organization for Standardization (ISO), can improve efficiency and reduce costs.

Social innovations can be embodied in innovative training and retraining programmes to help implement new technologies. They may include internships at other companies or participation in professional courses, trainings, and seminars. Social innovation projects aimed at improving living conditions in local communities are also important, for example, through the creation of cooperatives that support local farmers; innovative processing enterprises and rural green tourism enterprises, etc.

Social innovations, due to the close dependence of agricultural production on nature, should be complemented by environmental innovations. These include the introduction of organic farming; innovative biotechnologies for the production of organic fertilisers; and biodiversity conservation. They are complemented by energy innovations, namely the use of renewable energy sources, such as solar panels or wind turbines, and other green energy to meet the energy needs of agricultural enterprises.

At present, whether it is a single innovative development and innovation project or a set of innovations, they need to be well managed, especially in times of war and other uncertainties. Innovation management in agricultural enterprises is a complex process that covers the stages from idea or information about an innovation to implementation, including strategic planning, organisation, monitoring and evaluation of the results of innovation projects. This process is critical for improving production efficiency, competitiveness of agricultural enterprises and their adaptation to the ever-changing external environment.

The components of innovation management have also undergone some changes due to the war. For example, strategic planning is complemented by tactical or operational planning due to the need to respond to war threats on a daily basis. It is based on the formulation of clear goals for innovation activities. These may include goals for de-mining the territory and protecting employees; increasing productivity, reducing costs; improving product quality; and new sales channels. In accordance with the goal, market analysis is carried out; assessment of current problems and trends, competitors and consumer needs. This allows us to adapt innovative strategies to real needs. And only after that, an action plan is developed: a roadmap is created that details the steps, resources and timing of innovation implementation, its payback and effects.

In the process of managing innovations, large agricultural enterprises invest in research to generate new ideas and technologies that can be adapted to agricultural production; in prototyping new products or technologies to evaluate them in practice; in pilot projects of limited versions of innovations to assess their effectiveness and acceptability for implementation and sale. In general, innovation financing is an important area and task and, at the same time, a means of managing innovation. It involves identifying sources of funding; opportunities for attracting investment; their availability and conditions of receipt. They are complemented by the assessment and analysis of financial risks and the impact on the overall financial position of the enterprise. Finally, innovation management includes the organisation of monitoring and control of innovation costs to prevent exceeding targets or to adjust them.

The management of innovations of agricultural enterprises is carried out according to certain rules or principles. First of all, it is the principle of systematicity, when innovations

are considered as part of the overall strategy of enterprises that interacts with other processes. This helps to achieve synergies and maximise efficiency. The principle of flexibility and adaptability helps to respond quickly to changes in market and political conditions and innovation trends. This is important for maintaining the competitiveness of agricultural enterprises. The principle of active involvement of all process participants - employees, suppliers, customers and research institutions - allows for the use of different knowledge and resources, which increases the efficiency of investments.

These principles should be complemented by the principle of inclusiveness. As a result of the war, the number of people with disabilities in Ukraine has increased significantly. Currently, it has exceeded 3 million people, which is equal to or higher than the population of some countries (Tanasyshyn at the UN Headquarters 2024). Therefore, innovations should take this into account and be accessible to such people, improving their living and working conditions. In times of war, the principle of identifying and managing risks associated with innovation is of great importance for the implementation of innovations. This includes identifying potential problems and developing strategies to avoid or mitigate them. It is further supported by the principle of continuous improvement of innovation management – methods, technologies and approaches based on the analysis of the results obtained and appropriate adjustments.

The implementation of innovation management principles in agricultural enterprises is facilitated by their corporate culture. It includes support for creativity, openness to new ideas and readiness for change. It also includes organising regular training for employees to improve their skills in new technologies and management methods. This helps employees to be more competent and effective in innovation. Having a clear management structure allows for quick decision-making and implementation of innovations. This may include creating separate departments or teams or specialists responsible for implementing innovative developments and projects.

At the level of the external environment, innovation management principles are implemented through participation in joint research and partnerships with universities or research institutions, start-ups to develop innovations and meet innovation needs. And while this approach is typical mainly for large enterprises, constant monitoring of market trends and consumer needs is necessary and possible for all agricultural enterprises of all sizes, as it allows them to respond quickly to changes and adapt their products and services to market demands based on sound innovations.

The fundamental issue of implementing innovations remains the question of investing in them. First and foremost, these are their own resources, i.e. companies can use part of their profits to finance innovations, including reinvesting part of their income in the development of new products or technologies. Ukraine, despite the war, has programmes that support innovation initiatives in the agricultural sector, including subsidies, grants or preferential lending, and taxation (Pisarenko et al. 2023). Private investors may also be interested in investing in agricultural innovations, especially when it comes to risky start-ups with great potential. This includes crowdfunding, or the use of platforms to raise funds from a large number of people who are interested in supporting innovative projects. It can be an effective way to raise funding for new ideas.

To implement innovations in agricultural enterprises, make informed decisions and minimise risks, feasibility criteria are important. The main ones are revenue growth, cost reduction, or productivity increase; return on investment (ROI) as a ratio of profit to costs, which allows us to understand how profitable the project will be financially. The next criterion is competitiveness in the form of improved market position through understanding the importance of innovation in improving product quality, reducing costs,

etc.; impact on sales and business reputation. The criteria also include the possibility of implementation, its time and the payback period of innovations.

An important condition for the implementation of innovations is the assessment of their environmental impact and compliance with modern environmental standards. Social responsibility as a criterion for innovations involves taking into account their impact on employment, working conditions, salaries and employee welfare. Risks, threats and uncertainties should also be taken into account, and an action plan should be in place in case of negative developments. The criteria for the feasibility of innovations include the ratio of costs and benefits, budgets of innovation projects, including labour, material and operating costs.

Currently, in the context of the war, security risks have become the most important factor of feasibility. The ongoing hostilities pose a high level of risk to agricultural enterprises, complicating their operations and innovation, or even making it impossible. War leads to economic problems, reduced investment and financing of innovative projects. Agrarian enterprises, especially small ones, have limited access to loans and grants due to poor awareness, lack of specialists to justify the need for innovation and timely submission of applications; limited access periods; and large competitions for obtaining them. There is also a lack of or restrictions on the supply of raw materials, equipment and technology due to the war, which reduces the ability of agricultural enterprises to innovate.

Russia's war against Ukraine has led to unprecedented external and internal migration, population outflow, loss of labour resources and skilled workers. The mobilisation and displacement of workers reduces the number of specialists capable of implementing innovative projects, which negatively affects the overall competitiveness potential of agricultural enterprises. In times of war, there is a limited opportunity to participate in international programmes, conferences and exhibitions; to share experience in innovative activities.

However, even in such extremely difficult conditions, domestic agricultural enterprises retain their leading role and continue to implement both special innovations and innovations that are generally necessary. These include the use of digital technologies and robotic and automated equipment for demining large areas of land; reclamation of land affected by combat; digital management and administration. Therefore, an important trend in introducing innovations into agricultural enterprises is the digitalisation and automation of operations. It means the introduction of digital technologies to monitor, manage and optimise production and business processes; the use of digital agronomic platforms and drones to collect field data; online marketing, e-commerce and mobile commerce; digital finance, etc.

The next trend is the innovative support of established practices, such as organic farming, integrated management systems, and the introduction of innovative biotechnologies and energy solutions. This also includes the use of artificial intelligence in scientific research and the development of cognitive sciences to help people overcome the moral and psychological consequences of war. Cooperation with international partners to obtain technology and funding is of great importance, which, to some extent, helps to reduce the impact of internal problems.

After the war, Ukrainian agricultural enterprises will be able to take greater advantage of new technologies and farming methods to restore productivity and competitiveness. In the post-war period, there is a possibility of increased investment from international financial institutions and partner countries, which could help to promote innovative solutions. Due to global warming and other challenges, attention to the environmental and social aspects of agribusiness will increase, opening up new opportunities for sustainability-oriented innovations. Agricultural enterprises will have

greater potential to modernise production processes and introduce new technologies that were previously unavailable due to the war. As the economy recovers, demand for locally produced products may increase, which will promote innovation in production and sales. The growth of innovative education and innovative workers is also evident.

Conclusions

Thus, the basis for the introduction of innovations in agricultural enterprises in times of war is their ability to quickly affect performance through the latest technologies that can be relatively inexpensive (No till and other similar technologies, GPS navigation, UAVs, digital finance and automatic accounting and document management, green energy, demining, etc.) However, they are extremely diverse in terms of both content and cost. Therefore, when choosing the priority for their implementation, a comprehensive consideration of the factors that accompany it is of great importance. These include specialisation and location of production; goals and objectives of entrepreneurial activity; challenges and threats of a natural, socio-economic and military nature; personnel qualifications; the level of economic development and scientific and technological progress; and investments. At the same time, investments play a crucial role in ensuring innovations as their primary condition. In today's Ukraine, due to the total mining of almost 19% of the territory, huge social, natural and environmental, financial, production and economic losses as a result of the war, the state budget deficit, and losses of the vast majority of agricultural enterprises, investments from friendly countries; cooperation, clustering, and integration of agribusiness will be of great importance both in the current period and in the period of post-war recovery.

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Faktori un mehānismi inovāciju ieviešanai Ukrainas lauksaimniecības uzņēmumos kara laikā un to perspektīvas pēckara periodā

Kopsavilkums

Raksta priekšmets ir pamatot inovāciju nozīmi Ukrainas lauksaimniecības uzņēmumu funkcionēšanai un konkurētspējai kara laikā un atveseļošanai pēckara periodā, identificēt iespējas, draudus un prioritātes. Raksta mērķis ir identificēt būtiskākos faktorus un vektorus, kas ietekmē inovācijas lauksaimniecības uzņēmumos, izpētīt iespējas kā mazināt negatīvos un apdraudošos faktorus, kā arī pievērsties labvēlīgu apstākļu nodrošināšanai, lai pamatotu būtiskākās inovācijas darbinieku un uzņēmumu saglabāšanai kara laikā un to konkurētspējas nodrošināšanai nākotnē. Pētījumā ir izmantotas mūsdienīgas zinātniskas pieejas un metodes: sistēmstrukturālā analīze un sintēze – ar mērķi demonstrēt inovācijas kā sistēmu ar noteiktu struktūru un komponentēm, savstarpējām attiecībām un ietekmi uz lauksaimniecības uzņēmumu efektivitāti, tai skaitā sinerģisku; abstrakti loģiskā,

monogrāfiskā metode – noteikt inovāciju ieviešanas posmus un pazīmes lauksaimniecības uzņēmumos, lai raksturotu to secību un izmantošanu pašreizējā racionalizācijas posmā. Pētījumā tiek noskaidrots, ka inovācijām ir būtiska loma lauksaimniecības uzņēmumu resursu produktivitātes un ražošanas efektivitātes paaugstināšanā un to konkurētspējas nodrošināšanā lauksaimniecības tirgos. Tās sniedz būtisku labumu patērētājiem, paaugstinot pārtikas kvalitāti un uzlabojot uzturvērtības un garšas īpašības. Konstatēts, ka kara apstākļos šīs tradicionālās funkcijas tiek papildinātas ar cilvēku dzīvē svarīgāko funkciju – aizsardzības funkciju teritoriju atmīnēšanā, lauku darbu veikšanā, aprēķinu veikšanā, procesu vadīšanā, speciālistu un personāla apmācībā un pārkvalificēšanā, loģistikas un produktu pārdošanas nodrošināšanā. Secināts, ka kara apstākļos pieaug pieprasījums un nepieciešamība pēc inovācijām, savukārt ieviešanas iespējas, īpaši finansiālās un investīciju iespējas Ukrainā, krasi samazinās. Konstatēts, ka vēl viena būtiska problēma valstī gadu gaitā ir nevienmērīgā inovāciju pieejamība un atšķirīgas ieviešanas iespējas mazajiem, vidējiem un lielajiem uzņēmumiem; krasas atšķirības starp tiem inovāciju ziņā. Citiem vārdiem sakot, lauksaimniecības struktūrā ir pārstāvēti gan lielas augsti tehnoloģiskas un inovatīvas lauku saimniecības, gan vairāk tradicionālie mazie un vidējie uzņēmumi. Rakstā tiek identificēts sociālās atbildības trūkums, nepietiekama inovāciju ieviešana, nepietiekamas sociālās un vides inovācijas. Autori arī raksturo valsts lielo inovāciju potenciālu un tās konkurences priekšrocības Eiropas un pasaules kontekstā: labi attīstīta IT nozare, digitālā ekosistēma un digitālā pārvaldība; liels skaits augsti kvalificētu informācijas un digitālo tehnoloģiju speciālistu; un visaptverošs valsts atbalsts IT un digitālajām tehnoloģijām. Autori secina, ka Ukrainā ir iespējams ieviest visa veida augsti tehnoloģiskās inovācijas; ir aprakstītas to priekšrocības un to vadības mehānismi. Autori norāda uz nepieciešamību piesaistīt starptautiskos grantus un donoru fondus, lai investētu inovācijās lauksaimniecības nozares atjaunošanai; nodrošinātu drošību; attīstītu jaunus darbības veidus; risinātu demogrāfiskās krīzes, mājokļu rekonstrukcijas un citas lauku iedzīvotāju sociālās problēmas. Ilgtermiņā nozīmīgas būs inovatīvas augsnes apstrādes tehnikas un tehnoloģijas; biotehnoloģijas; biznesa procesu un vadības digitalizācija; un digitālais mārketings. Nepieciešams paredzēt pasākumus inovācijas procesa attīstības atbalstam mazajos un vidējos uzņēmumos, tai skaitā uz publiskās un privātās partnerības bāzes.

Atslēgas vārdi: inovācijas, lauksaimniecības uzņēmumi, kara draudi, biotehnoloģija, diversifikācija, sociālais atbalsts, apzaļumošana.

Yevhenii Kostyk (Ukraine)

FEATURES OF APPLYING MOTIVATIONAL TOOLS IN THE PROCESS OF FORMING THE INTELLECTUAL CAPITAL OF AN ENTERPRISE

Under modern conditions of national economic development, the intellectualization of all spheres of human economic activity is becoming increasingly evident, as intellectual capital plays a key role in forming unique competitive advantages, which are an important component for the innovative development and competitiveness of an enterprise. The growing importance of intellectual capital necessitates the development and implementation of effective motivational tools that contribute to its formation and development. Thus, the application of motivational tools in the process of forming the intellectual capital of an enterprise is critical for its innovative development and competitiveness. Therefore, optimizing motivational mechanisms allows transforming individual potential into collective intellectual capital, which is essential for the successful operation of an enterprise in the modern economy. The aim of the research is to reveal the peculiarities of applying motivational tools in the process of forming the intellectual capital of an enterprise based on the theoretical foundation.

Keywords: intellectual capital, intellectual potential, intellectual resource, management of intellectual capital, mechanism of motivation for the economic activity of hired employees.

Introduction

Under modern conditions of national economic development, the intellectualization of all spheres of human economic activity is clearly observed. The importance and significance of intellectual capital are increasing and continue to grow, as it ensures the formation of unique competitive advantages for both the creator of the intellectual product and the economic entities that use it. In turn, at the micro level, intellectual capital depends on the availability of intellectual resources, which are transformed into the intellectual potential of the enterprise, used at a given moment in time. However, according to H. Nahornyak (Nahornyak 2018), the category of intellectual potential itself is somewhat broader than intellectual capital and financial resources. The problems of forming intellectual potential lead to the problems of forming intellectual capital, as well as the transformational processes of the enterprise's financial potential into intellectual resources and intellectual potential. The basis for the emergence of these problems lies in unresolved issues related to the sources, evaluation, and protection of the enterprise's intellectual resources (Nahornyak 2018, p. 77).

The aim of the research is to reveal the peculiarities of applying motivational tools in the process of forming the intellectual capital of an enterprise based on the theoretical foundation.

Materials and methods. Theoretical and the methodological base of the study consist of scientific works of leading domestic and foreign economists on the study of problems such as intellectual business, potential and development of the enterprise, entrepreneurship and business culture; legislative acts, regulatory documents in the field of entrepreneurship, entrepreneurial activity and intellectual property. The research methodology is based on the following scientific methods: system analysis; logical generalization; comparison; structural-functional.

Results and discussion

The position is quite justified Yu. Manukhina, which is focused on the fact that intellectual potential (resource) is a component of intellectual capital, which, in turn, consists of

human resources (intellectual power) and intellectual resources (intellectual product) (Manukhina 2016, p. 83).

Intellectual potential is a "critical mass" of highly qualified specialists who are able to find and implement the latest technologies and have high moral qualities.

An intellectual product in its natural dimension is a product of creative collective efforts, the result of mental, intellectual work, intellectual innovative activity.

At the same time, intellectual work is the essential basis of the process of creating an intellectual product and reproduction of intellectual capital.

According to the researchers, in the conditions of the development of the information society, traditional approaches to the definition of intellectual capital do not fully reflect its essence, and therefore, intellectual capital should be considered as a set of: human, organizational, consumer and information capitals, which interact with each other (Manukhina 2016, p. 83).

Based on the position outlined above, it can be stated that intellectual capital is a complex of interconnected resources that do not have a material form and the ability of participants in the production process to use the acquired knowledge and skills to create innovative products, contributing to the development of the national economy.

Today, intellectual capital is the main factor that determines the competitiveness of economic systems, acts as a key resource for their development, and therefore the understanding of the process of the formation of intellectual capital lies in the plane of interaction of its constituent elements, such as: trade secrets, copyright, patents, goodwill, knowledge, cooperation, solvency, structural subordination, etc.

H. Nahorniak's assertion is quite convincing, stating that intellectual capital consists of two interrelated components: natural (intellectual potential) and artificial (technologies and results of intellectual activity). It is the results that ensure the success of an employee, a group, an organization, which are manifested in the form of social and economic benefits (career growth, premium payments, income from created intellectual property objects, high business reputation, competitive advantages, increased business value, etc.), and therefore, in order to achieve social good (recognition of one's value by colleagues and management of the enterprise, satisfaction with the quality of work), the employee needs to demonstrate his intellectual abilities, personal qualities, professional knowledge and job skills (Nahornyak 2018, p. 79). And this once again confirms that for enterprises, institutions, organizations and companies that claim to preserve their competitiveness in the conditions of a knowledge-based economy, and their existence as a whole, will primarily depend on the productivity of the intellectual work of management and executive personnel.

The majority of scientists, considering the problems outlined by us, are convinced that the intellectual capital of the enterprise is based on knowledge, and therefore, an integral part of intellectual capital management is knowledge management. Knowledge management is presented as a flow, a method of transfer, a communication tool with the organization's external environment, that is, as a mechanism for strengthening intellectual capital. However, the management of intellectual capital is not only the management of knowledge, but also the method of its distribution: the management of increasing the knowledge potential, increasing the value and valuation of intellectual capital. Therefore, management of intellectual capital should be considered as a process consisting of three levels. At the basic level, knowledge management initiates the knowledge base of the distribution of intellectual capital by assimilating external knowledge, integrating internal knowledge, and creating new knowledge. At the expansionist level, the value of the enterprise's intellectual capital can be increased through its expansion, which in the end can lead to an increase in the value of the enterprise as a whole. At the strategic level, the intellectual capital management of the enterprise, as a subsystem of the general enterprise man-

agement system, must correspond to the general strategy of the enterprise's development and carry out appropriate regulation of the areas of activity in accordance with the generally accepted enterprise (Manukhina 2016, p. 84).

It should be noted that an important aspect of managing intellectual capital, as N.F. Yefremova, O.V. Zolotaryova, and V.I. Roienko are convinced, is the issue of building and implementing an effective motivational system in the activities of domestic enterprises. Therefore, it is necessary to modify the motivational tools and improve the mechanism of motivation for the economic activity of hired employees (Yefremova, Zolotarova, Roienko 2015, p. 43).

In order to specify the place of the motivational mechanism in the systemic activity of the enterprise, V. Liganenko considers its following components (Liganenko 2016, p. 132):

- motivational component forms a mechanism that interacts with other processes of intellectualization and should function taking into account the needs and interests of both employees and consumers, whose consciousness is formed under the pressure of external social factors, and should be considered as a sequence of five factors: demand – interest – motive – action is the result. One should agree with the opinion that the motives cause the desire of the staff to immerse themselves more deeply in innovative and informational processes, to activate their internal and external driving forces. The correct representation of the motives of creative activity is realized by a person. The main means of motivation are moral and material incentives - means of influencing personnel with the aim of forming the desired work behavior. They are elements without which the formation of creative consciousness is impossible or very difficult. As with the innovation process, all elements of the motivational process make up a complex, which includes: financial resources; material and technical base for conducting research; release of innovative products or introduction of innovations in the process of product release; availability of information for making technical, economic and organizational decisions;

- innovative component motivational mechanism consists of several complex internal tools, namely: the first set of tools – idea, licensing, patent, personnel, research work; the second - intellectual capital, information development, marketing activity and motivational mechanism, which are promoted through the improvement of the incentive system; the third – invention, rationalization, construction, creation of engineering and technical facilities, information and marketing activities;

- information component, or informatization, is an important component of the process of intellectualization of the enterprise, because it will initiate new trends and approaches at the stages of the enterprise management process, while the motivational mechanism for stimulating the enterprise's personnel is responsible for the process of transforming information into knowledge. Under such conditions, the process of intellectualization takes place.

As for the content of the motivational mechanism, in order to clarify it, it is necessary to clarify the essence of the motivation of the economic activity of employees, namely: firstly, it is an economic category that expresses the relationship between the state, society, employers, on the one hand, and employees, on the other hand, regarding the actualization and transformation of the needs, interests, values, and motives of employees in order to increase production efficiency; secondly, motivation is the process of employees' awareness of priority factors of activity and determination of its goals, the degree of achievement of which indicates the effectiveness of motivation; thirdly, motivation should be considered as a set of external motivational tools, which are periodically modified and determine the direction and effectiveness of the economic activity of employees, and realized and activated internal motivational tools.

In the opinion of V. Semikina and M. Petina, the intellectual activity of an individual or group, that is, the activity of the intellectual, creative component of labor activity, largely depends on both conditionally permanent and variable factors that can be effectively managed in order to improve the processes of creative labor activity at the enterprise (Semikina, Petina 2015, p. 79-80).

Scientists distinguish the following groups of factors: physical and psychological (state of health, mood, family situation); factors of interest (the prospect of improving one's status at the company, the degree of coincidence with personal cognitive interests (self-development, development of professional qualities), the prospect of expanding the sphere of influence, the development of communication ties, the degree of novelty of the work task, the degree of its significance for others, the degree of intuitive increase in self-esteem); environmental factors (natural (weather, season, time), factors of working conditions and ergonomics (number of people in one room, noise level, degree of movement of objects in the room, lighting of the room, level of ergonomics of the workplace, its location, possibilities of quick information search and exchange)).

Hence, the possibilities of managing conditionally permanent and variable factors that affect the activity of intellectual labor activity of employees should be taken into account when developing measures to increase employee self-motivation and the formation of motivational mechanisms of the enterprise in relation to personnel.

If a person creates favorable conditions for work and development of abilities, creative potential, if he feels the unity of his own interests with the interests of the enterprise, then important prerequisites for active productive creative work will be laid.

Thus, it is worth noting that an effective combination of various forms of motivational stimulation will lead to the satisfaction of the needs of employees, the formation of active work behavior in them and the achievement of the main goal of the enterprise – profit maximization (Semikina, Petina 2015, p. 80).

In the context of our research, we should use the classic scheme according to which three groups of employee motives can be distinguished: 1) intellectual; 2) material; 3) moral.

To the first group of motives intellectual self-development, inquisitiveness, passion for an idea, love for solving difficult problems, striving for full realization of one's intellectual abilities can be attributed.

The second, no less important incentive for creativity is material interest in receiving a material reward, although some modern researchers believe that material factors for an employee of a modern corporation, as a creative individual, have ceased to play a dominant role, since against the background of achieving prosperity and well-being, the pressure of material needs decreases and a person gradually moves away from the usual stereotypes of work behavior, somewhat loses the purely material motivation in the field of work, which was characteristic of previous societies, increasingly seeks to satisfy nonmaterial needs (Semikina, Petina 2015, p. 83).

The third stimulus serves as a moral reward - recognition by the company of the value of the work, the employee's contribution to the development of the company; the employee's feeling of his special significance for the company, his special vocation. Moral incentives contribute to the creation of a positive social feeling of a person.

Speaking about the model of the motivation mechanism, it should be considered as a complex, multi-level system that describes the goals and results of the employees' activities in relation to the reward for their achievements, the assessment of creativity. The development, implementation and functioning of the model of the motivation mechanism aimed at the development of personnel creativity should be based on a systematic approach. In turn, the action of the motivational mechanism should activate creative abilities, innovative be-

havior, strengthen the desire to generate new ideas, make innovative but balanced management decisions aimed at the development of intellectual products.

In their research, N.F. Yefremova, O.V. Zolotaryova, and V.I. Roienko note that existing scientific theories focus on the motivation of the labor activity of hired employees, who were perceived as a factor of production rather than as individuals. In such a motivational mechanism, a one-sided, hierarchical influence on the activities of employees prevails, to which they responded in an expected manner, agreeing to specific actions. Therefore, the mechanism of motivation for the economic activity of hired employees takes into account the fact that the individual not only perceives the motivational influence of the state, society, and employer but also realizes internal motivational factors, which undergo transformation both independently and under the influence of external factors. Summarizing the consequences of these transformations, the individual carries out motivated economic activity, the direction and effectiveness of which may or may not coincide with the goals of external motivators (Yefremova et al. 2015, p. 43).

The motivational mechanism outlined above performs four functions: reproductive – aimed at ensuring high efficiency of social production; regulatory – blocking ineffective motivational tools and catalyzing effective ones; communicative – ensuring the interaction of motivational subjects in order to optimize their influence on the economic activity of employees; innovative – activation of the creative potential of employees and the introduction of innovations in production (Yefremova et al. 2015, p. 43).

It should be noted that there is practically no unified approach to the implementation of the mechanism for motivating the economic activity of employees at enterprises. However, despite the branch affiliation of the enterprise, its specific features, the main elements of the motivational component affecting the efficiency of the economic activity of employees are: salary as an objective assessment of the employee's contribution to the enterprise's results; system of internal company benefits for employees: effective bonuses, additional payments for seniority, employee health insurance at the expense of the company, provision of interest-free loans, payment of travel expenses to the workplace and back, discounted meals in the work canteen, selling products to employees at cost price or with a discount; increasing the duration of paid vacations for certain successes in work; providing the right to go to work at a time more convenient for employees; elimination of status, administrative and psychological barriers between employees, development of trust and mutual understanding in the team, which is ensured by the existence of a developed corporate culture at the enterprise; professional development and promotion of employees.

Conclusions

Thus, an effective motivational strategy for forming the intellectual capital of an enterprise should aim at minimizing unrealized potential, and consequently, it is necessary to synchronize the interests of employees who possess knowledge, skills, and experience accumulated through education, professional training, or practical activities with the strategic goals of the enterprise.

The research showed that one of the key aspects of an effective motivational strategy for forming the intellectual capital of an enterprise is the stimulation of self-investment, which involves creating conditions under which employees independently invest in their own professional development.

It should be noted that the motivation of the intellectual capital of an enterprise should be carried out through the creation of a retention environment, which involves a comprehensive approach to retaining highly qualified specialists by forming conditions

that ensure their professional realization, socio-economic stability, and emotional attachment to the organization.

We have proven that an important component of an effective motivational strategy for forming the intellectual capital of an enterprise is the development of intellectual leadership, which is based on the combination of a culture of trust, technological maturity, and organizational flexibility. This, in turn, transforms human capital into a sustainable innovative resource.

Therefore optimizing motivational mechanisms allows transforming individual potential into collective intellectual capital, which is critical for the innovative development and competitiveness of the enterprise.

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Motivācijas rīku pielietošanas iezīmes uzņēmuma intelektuālā kapitāla veidošanas procesā

Kopsavilkums

Mūsdienu tautsaimniecības attīstības apstākļos arvien vairāk izpaužas cilvēka ekonomiskās darbības visu sfēru intelektualizācija, jo intelektuālajam kapitālam ir galvenā loma unikālu konkurences priekšrocību veidošanā, kuras ir svarīga uzņēmuma inovatīvās attīstības un konkurētspējas sastāvdaļa. Intelektuālā kapitāla pieaugošā nozīme prasa izstrādāt un ieviest efektīvus motivācijas instrumentus, kas veicina tā veidošanos un attīstību. Tādējādi motivācijas instrumentu pielietošana uzņēmuma intelektuālā kapitāla veidošanas procesā ir kritiski svarīga tā inovatīvajai attīstībai un konkurētspējai. Tāpēc motivācijas mehānismu optimizēšana ļauj pārveidot individuālo potenciālu kolektīvajā intelektuālajā kapitālā, kas ir būtisks uzņēmuma veiksmīgai darbībai mūsdienu ekonomikā. Pētījuma

mērķis ir atklāt motivācijas instrumentu pielietošanas īpatnības uzņēmuma intelektuālā kapitāla veidošanas procesā, balstoties uz teorētiskajām atziņām.

Atslēgas vārdi: intelektuālais kapitāls, intelektuālais potenciāls, intelektuālais resurss, intelektuālā kapitāla pārvaldība, nodarbināto ekonomiskās darbības motivācijas mehānisms.

Murman Kvaratskhelia (Georgia)

SOME ASPECTS OF GEORGIA'S ECONOMIC SECURITY

The article presents the issues of the country's food problem. Post-independence trends in food security in the form of individual food products are analyzed. The dynamics of the types of strategic products that play an important role in providing the population with living standards are shown. A systematic analysis of the import dependence trends of the main food products has been studied, where are shown the changes the different types of products have undergone after the independence of the country. In addition, the recommendations for getting out of those negative processes are shown in terms of ensuring stability in the long term. In this regard, the State strategy is of particular importance, which must be implemented with a certain goal to achieve food stability.

Key words: economic security, food security, rational food norms, agriculture, import, self-sufficiency.

Introduction

For the sustainable and stable development of the State, a thoughtful, rational and effective economic policy is necessary, the most important component of which is the provision of the economic aspects of State security. A necessary prerequisite for this is macroeconomic stability, normal level of unemployment, low inflation. Maintaining a stable exchange rate of the national currency also regulates imports. It is also important to provide the population with the quality food. In this regard, healthy and rational nutrition becomes the most important aspect of State security.

Georgia, with its open economy and fairly liberal economic policy, exports and imports several hundred denominations of goods (only in 2023, Georgia exported 920 denominations of commodity (HS 4-digit) nomenclature and, accordingly, imported 1138 denominations of commodity nomenclature), on the 5 largest import goods. It accounts for more than half of all imports, and almost 40% of exports, respectively. The import of agro-food products does not lag behind the added value produced in the country's agrarian sector, but even exceeds it by 10.2 percent (as of 2023). The mentioned situation is in clear contradiction with the economic security of the country. In this case, the country's economic security in export-import faces serious problems, if any commodity or country occupies more than 1/3 of all exports and imports, respectively.

Research Results

One of the important aspects of the country's economic security for ensuring the sustainable and dynamic development of its population and economy is food security. It is so voluminous and multifaceted, it performs the main function of the socio-economic policy of the State. Food security means, first of all, providing the population with the required amount, complete and balanced, harmless and affordable food.

Food security of an individual is the possibility of physical and economic obtaining of the quantity, assortment and quality of food products necessary for ensuring human life, development and active life.

The food problem is generally both physiological and socio-economic. In addition, food security has a political aspect. It is the potential of a country to produce and access food products in such quantities that it does not make a given State too dependent on other countries. Of the latter, without turning the process of food supply into a tool of political influence (embargo, cabal conditions of supply, price manipulation, etc.). Therefore, the food security of the population, taking into account the above-mentioned conditions, is a necessary, but not sufficient, condition for ensuring the food sustainability of the country's

and the State's productivity. In today's world, the great attention to agriculture and food security is due to several circumstances.

Self-sufficiency in food is a guarantee of security and sustainability. The sharp growth of the middle class in the population leads to the growing demand for food and, accordingly, the trend of an inexorable increase in its prices. At the same time, on a global scale, the growth of population and incomes is clearly ahead of the growth of food, primarily grain production. Therefore, food security, as a factor ensuring public peace, stable development of the country, independence and security, occupies a leading place in the strategy of all States.

Traditional economic activities in rural areas, together with the preservation of the country's recreational wealth and social values, means the establishment of the population firmly in place, providing employment, reducing the scale of migration and erecting economic barriers for the development of demographic processes in an undesirable direction. As we can see, agriculture is a priority sector, which permanently becomes an object of concern.

In Georgia, despite some recent signs of stabilization, agriculture remains the weakest link of the economy. Labor productivity in this field is 3-4 times lower than in other sectors of the economy, and energy consumption per unit of value of produced goods is 16.3 times lower.

It should be noted that the reason for the backwardness of the agricultural sector of Georgia is multifaceted. Despite its divisive nature, for a long time it was not given due attention, especially in terms of financing. A kind of privileged situation during the time of the Soviet Union, when employment in agriculture and the sale of products grown in private farms at high prices in the single economic space of the country allowed rural residents to live quite comfortably, which no longer existed in the post-Soviet period. Because such "preferences" immediately ended after the collapse of the USSR, which was followed by a systemic crisis in the industry, stagnation and a sharp decline in the well-being of rural residents (Archvadze 2020, p. 9).

For more than three decades, after the mass rejection of collective farms in agriculture, cooperative activities in Georgia could not gain a foothold. Because of this, it is difficult to increase productivity and achieve synergy effects at the expense of large equipment and technologies. In fact, there was no development of agricultural science, technological updating and research, transfer and introduction of world experience. We firmly stand on the opinion that modern Georgian agriculture lags behind advanced countries by about one technological era (Archvadze 2017, p. 22). This backwardness has its own dramatic expression: in terms of value, Georgia's level of self-sufficiency in agro-food production is quite low (47.8%), while in Israel, which is in much worse climatic conditions compared to Georgia, the similar rate is 92% (Koghuashvili, Archvadze 2020, p. 74).

The fact that agriculture is the weakest link of the Georgian economy can be seen from the fact that almost three decades after the collapse of the Soviet Union, the profile of the specialization of agricultural production, which was formed in the middle of the 20th century and which was completely adjusted to the needs of the single market of the USSR, is still high, with satisfaction. Due to this, the production of southern and subtropical crops (fruits, citrus fruits, grapes etc.) has a relatively high share in Georgia, while the country needs a relatively high level of self-sufficiency in terms of grain and meat production.

Georgian agriculture still maintains the stigma of the "weakest link" of the economy. The growth rates of this sector significantly lag behind the growth rates of the national economy, which unequivocally confirms that the biggest threat of vulnerability in terms of food security is the dire situation of the agricultural sector, including a visible lag with the parameters of the 1980s, even before the reform.

The data of the National Statistics Service clearly show the scale of the mentioned backwardness. Compared to 1988, grain production in 2023 was 76% per capita; potatoes - 89%; fruits - 50%; Grapes - 68%; citrus fruits - 18%; tea - up to 1%; meat - 3%; Cattle (thousand head) – 55%; Pig (one thousand head) – 20%; Sheep (one thousand souls) – 7%; milk - 113%; Egg - 108%.

The provided data confirm that, against the background of the total move back for more than a third of the last century, the lead in terms of production per head of the population has been achieved in terms of only two parameters – milk and eggs.

It is true that the financial support of the agricultural sector from the State has increased in recent years, however, the economic growth of the sector is still weakly correlated with the increase in state subsidies. For example, in 2022, compared to 2012, the financing of agriculture from the State budget increased 3.3 times and more (by 232.8% - from 204.5 million GEL to 680.6 million GEL). While the added value created in the sector in 2022 is only 25.7 percent higher than in 2012 (at current prices - 93.8%). It is true that during the same period, the export of agro-food products from the country increased significantly (2.5 times), which is due to the food and processing industry more than to agriculture itself (National Statistics Office of Georgia (GeoStat) n/d).

It is interesting to see the relationship between food imports and self-sufficiency in the country. Currently, the population of Georgia is about 3.7 million per person is 2/3 of its peak rate (5.40 million people in the early 1990s). Despite such scarcity, the grocery basket of the population of Georgia (which, in terms of its composition and the minimum level of satisfaction of the population, is quite far from optimal). More than half of it consists of imported products, while the biogeoclimatic potential of Georgia is to feed at least 10-12 million people. If the right agricultural policy is implemented, the country can achieve a balanced trade balance and 85% food self-sufficiency level by 2030, i.e., a conditional benchmark necessary to ensure the country's food security.

If we look through the numerical data, it shows that as of 2022, the share of imports in resources is characterized by the following data: wheat - 76.3%; corn - 22.9%; potatoes - 9%; vegetables - 29.4%; meat - 54.7%; Milk and milk products - 21.3%; Egg - 3.8% (National Statistics Office of Georgia (GeoStat) 2023), pp. 111-112). From this we can conclude that the country still cannot ensure its own security with such strategic food products, such as wheat and meat. Such a situation remains a serious challenge in the near future in terms of the import dependence. And this is also a contributor to many negative factors, such as the increase in unemployment, the increase in poverty, etc.

One significant fact should be noted. After gaining independence, a significant trend can be observed in Georgia: the import of agricultural products and food products is growing rapidly. In 2023, its volume increased 12.0 times compared to the beginning of the century, while the country's economy – about 3.3 times, and agricultural production – only 1.6 times. Such import dependence, in addition to reducing the number of jobs and leading to an increase in motivation for emigration along with unemployment, leads to the outflow of foreign exchange resources from the country. Only during the last ten years, the total amount of negative trade balance of agro-food products was reached 3.6 billion US dollars, and since the beginning of the century – 11.5 billion USD (National Statistics Office of Georgia (GeoStat) n/d).

In addition, in terms of state security, high import dependence on grain and flour remains a particularly vulnerable direction. Moreover, this attitude comes from such an unpredictable and aggressive neighbor as Russia. In 2023, 99 percent of all wheat imports came from the Russian Federation (National Statistics Office of Georgia (GeoStat) n/d).

Over-reliance on imports, especially if a country has a monopoly on the import of goods, makes the receiving country a potential supply hostage, with at least three threats.

First, immediate stoppage of supply, embargo or sanctions on these products will create serious problems in meeting the needs of the country's population, as it will be necessary to reorganize the supply chains, which is a time-consuming process. In addition, such a situation, as a rule, significantly increases the price of products in the consumer market. Second, the export quota in the supplier country, the introduction (increase) of export fees also increases the price of products and, therefore, directly affects the well-being of the population. Third, in the case of unfair competition and subsidization by the supplying country, the sale of imported products at dumping prices on the market undermines the profitability of local production of said products, in general - the expediency of its production, and leads to an increase in import dependence.

In order for the State to better ensure the food security of its citizens, it is necessary to implement a targeted, effective domestic policy through production organization, management, raising the labor productivity of employees in the agro-food sector, and a subsidy system. However, in order to achieve success, the experience of other countries and the recommendations of the International Food and Agriculture Organization (FAO) are also of great importance: a) Ensuring the protection of local entrepreneurs so that this does not harm the interests of local consumers and b) improve access (purchasing power) of the latter to bread and bakery products.

Taking into account the mentioned circumstances, the consistent move of the country's agro-food sector to gain a competitive advantage on the regional and global markets will play an increasingly important role in ensuring food security. For this, the political will of the ruling power and the competence of the decision-makers, the entrepreneurial skills and qualifications of the persons directly employed in the production process, and, therefore, the level of their labor productivity, should play a decisive role. The strategic direction of ensuring food security should become a significant increase in grain production in the country. In economically developed countries, support of the market prices and a high share of direct payments to rural producers (18-20% of the total volume of agricultural financing) play a major role in ensuring food security.

The process of ensuring food security should cover not only production and circulation, but sales areas as well, in which a combination of protectionist and fiscal measures provide a cumulative positive effect in terms of protecting the interests of both local producers and consumers. In particular, at the normative level (in the Tax Code), the experience of economically strong countries should be reflected in the reduction of the VAT rate on bread to 7-8% or even the elimination of it altogether. In short, the government strategy should aim to solve two main tasks:

a) ensuring the protection of local entrepreneurs so that it does not harm the interests of local consumers;
b) to improve the latter's access (purchasing power) to bread and bakery products.

In addition, the solution to the issue of food consumption growth for a country with a transition economy, such as Georgia, cannot depend either on the further redistribution of land or on the strengthening of State subsidies for the agro-food sector. The issue can be resolved only in conditions of macroeconomic stabilization and steady growth of real incomes of the population. Therefore, macroeconomic stabilization and development is the only way to increase the country's food security, as the growth of the economy leads to the growth of real incomes of the population and, accordingly, the demand for payment, which, in turn, determines the development of the agro-food sector.

Conclusion

The strategic direction of ensuring food security in the country should become a significant increase in grain production. More attention should be paid to replacing imports with locally produced products, the production conditions of which, as well as resources, historical and professional experience exists in Georgia.

The experience of the countries that have made visible progress in ensuring food security, including the timely and effective use of tools characteristic of the market economy (taxes, preferences, subsidy and quota system, credit policy, etc.) should be taken into account.

Taking into account that due to the uneven distribution of food on a global scale and the artificial shortage of its individual species, individual States are increasingly using food for political pressure and blackmail on its importing countries, the strategic direction of the Georgian State's economic and agrarian policy should become the protection of domestic producers from the negative effects of the foreign market conjuncture.

By carrying out the mentioned measures, not only the issue of food security of the country will be solved, but also the most important task, which is the other side of the mentioned security medal - the essential solution to the problem of poverty. The essential solution of the problem of food security and poverty is related to the functioning of a more extensive social task - the functioning of the just, fair and democratic society.

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Daži Gruzijas ekonomiskās drošības aspekti

Kopsavilkums

Rakstā tiek aplūkoti valsts pārtikas problēmas jautājumi. Tiek analizētas tendences pārtikas nodrošinājumā pa atsevišķiem pārtikas produktiem pēc neatkarības atjaunošanas. Tiek parādīta to stratēģisko pārtikas produktu dinamika, kuriem ir svarīga loma iedzīvotāju dzīves līmeņa nodrošināšanā. Rakstā tiek veikta sistemātiska galveno pārtikas preču importa atkarības tendenču analīze, kurā parādītas izmaiņas, kādas ir notikušas ar dažādiem produktiem pēc valsts neatkarības atgūšanas. Turklāt, tiek piedāvāti ieteikumi, kā izkļūt no šiem negatīvajiem procesiem, lai nodrošinātu stabilitāti ilgtermiņā. Šajā sakarā īpaša nozīme ir valsts stratēģijai, kas jāīsteno ar noteiktu mērķi – panākt pārtikas nodrošinājuma stabilitāti.

Atslēgas vārdi: ekonomiskā drošība, nodrošinātība ar pārtiku, racionālas pārtikas normas, lauksaimniecība, imports, pašpietiekamība.

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THE SITUATION ON THE LABOR MARKET IN LATVIA AND POLAND AND THE ATTRACTIVENESS OF EMPLOYERS FROM THE PERSPECTIVE OF STUDENTS

The article presents the results of theoretical and empirical research on the situation on the Polish and Latvian labor markets and the attractiveness of employers in both countries from the perspective of students. The empirical research was conducted between December 2023 and January 2024 (at the War Studies University in Poland and the Daugavpils University in Latvia) using a diagnostic survey method on a sample of 276 students (150 from Poland and 126 from Latvia). The research showed that students in both countries rate the national labor market situation the highest. On the other side of the spectrum, local labor market situation within the area of students' permanent residence was ranked the lowest. The Polish students declare a higher level of attractiveness in the case of private employers, in contrast to the Latvian students, who perceive both public and private employers as quite attractive. According to both the Polish and the Latvian students, employer attractiveness is determined by job stability and work atmosphere, with the most important factor for the Polish students being salary, while the Latvian students also consider working conditions and a clear career path as significant.

Key words: labor market, employer attractiveness, students' perspective.

Introduction

The labor market is a crucial element of any economic system (Witkowska et al. 2019), which affects the level of competitiveness in economy, its innovativeness, and the quality of employees' life. Viewing the market as a specific institution of social life lays an emphasis on the constant and regular interaction of people riddled with norms, values, and customs that vary depending on the country's culture. The process of selling and buying such a specific commodity as labor (a market good) (Kozek 2014) is linked, on one hand, to the necessity for workers to possess certain competencies that are key from the perspective of employers and their needs, and on the other hand, to the expectations of workers towards employers, whose fulfillment translates into the attractiveness of the organization as a potential employer and the ability to conduct an effective battle for talent (Chambers et al. 1998).

The two key entities in the labor market, namely employers and employees, constitute very complex and specific groups. Employers include public organizations, business entities, and non-profit organizations. Each of these employers, from the perspective of needs and expectations of employees, possesses a certain level of attractiveness, which is a variable value over time, conditioned by the situation in the national, local, and regional labor markets, as well as the professional aspirations of employees. Many determinants of attractiveness can be distinguished, which should prompt organizations to study target groups — desired employees — to understand their opinions and thus implement tailored solutions. The second group in the labor market consists of employees and it should be emphasized that potential future employees also include students. Considering the potential of this group, measured not only by its size but also by the diversity of competencies and the flexibility of their development, understanding students' opinions on the labor market and employer attractiveness allows for a fuller comprehension of the reasons behind career choices and the prediction of certain behaviors. Focusing on the importance of organizational attractiveness as an employer, a key intangible value, and considering the diversity of situations in different labor markets, the main aim of the article is to present two perspectives – those of the

Polish and the Latvian students regarding their opinions on both the labor market situation and employer attractiveness, as well as the factors determining this attractiveness.

The main research problem was formulated as a question: What is the level of attractiveness of organizations from the business, public, and non-profit sectors as employers in the opinion of the Polish and the Latvian students? The specific issues included the following questions:

1. How do the Polish and the Latvian students assess the situation in the national, regional, and local labor markets?
2. What are the key factors of employer attractiveness in the opinion of the Polish and the Latvian students?

In order to provide answers to the indicated research problems empirical research was carried out using the diagnostic survey method utilizing the traditional poll technique on a sample of 276 students (150 from Poland and 126 from Latvia). The study was conducted from December 2023 to January 2024 at War Studies University in Poland and Daugavpils University in Latvia.

The Labor Market in Poland and Latvia

Awareness of the need to function in the labor market is shaped from an early age. Educational institutions in both Poland and Latvia, through the implementation of specific learning programs, undertake actions to prepare young people for functioning in the labor market by equipping them with necessary competencies and qualifications. The diversity of educational environments and directions of undertaken efforts should be linked to the different economic situation of individual countries, as well as the social need and work culture. Poland and Latvia, as two bordering member states of the European Union (EU) joined the EU on May 1, 2004. The labor market situation in both countries is slightly different, which can be illustrated by referring to basic labor market indicators such as the unemployment rate, employment rate, and educational indicators. The unemployment rate in Poland and Latvia from 2009 to 2023, compared to other Central and Eastern European countries and the EU 27, is shown in Figure 1.

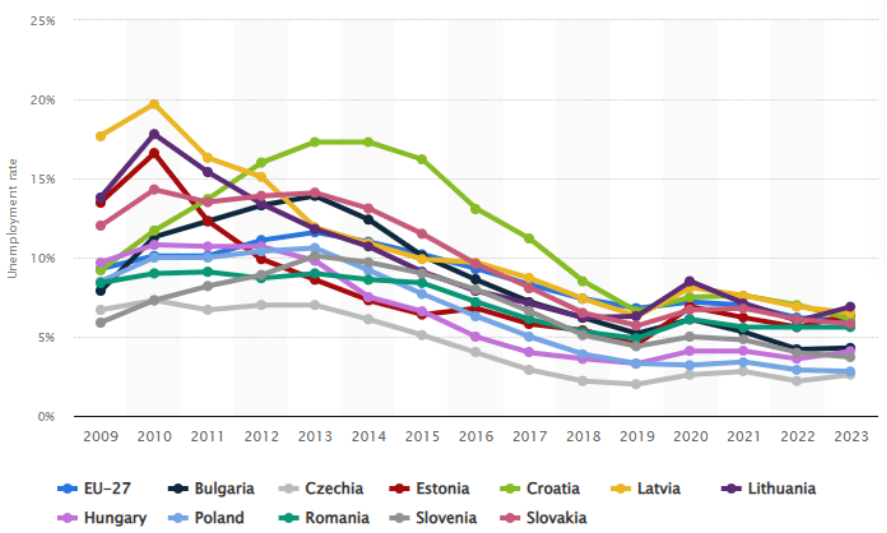

Figure 1. **Unemployment rate in Central and Eastern Europe (CEE) from 2009 to 2023, by country**

Source: Statista (2024).

In 2023, Czech Republic and Poland had the lowest unemployment rate among Central and Eastern European (CEE) countries, at 2.6 percent and 2.8 percent, respectively. On the other hand, the highest unemployment rate was recorded in Lithuania (6.9%) and Latvia (6.5% - a 0.28% decline from 2022). The EU unemployment rate in 2023 was 6.1%, the lowest since 2014. The unemployment rate in the EU concerned people aged 15-74. However, the national unemployment rate does not reflect regional differences in this respect, which are visible in both Poland and Latvia. The analysis of the situation in Poland in 2023 shows that the highest unemployment rate was recorded in the Warmian-Masurian Voivodeship (8.9%), the lowest in the Greater Poland Voivodeship (3.0%) (Ministerstwo Rodziny, Pracy i Polityki Społecznej 2023). In the Mazovian Voivodeship, where the research was conducted, the unemployment rate was 4.2%. In Latvia, the highest unemployment rate was in the Latgale region – 9.8% (the region where the research was conducted; in March 2023 it reached 12.6% (EURES 2023), the lowest in the Pierīga statistical region (4.8%).

When analyzing the labor market, it is also appropriate to focus on the unemployment rate among people under the age of 29. In EU there is a consistent trend demonstrating that the unemployment rate for young people aged 15-29 years exceeded the overall unemployment ratio (for people aged 15-74) since 2014 (Figure 2).

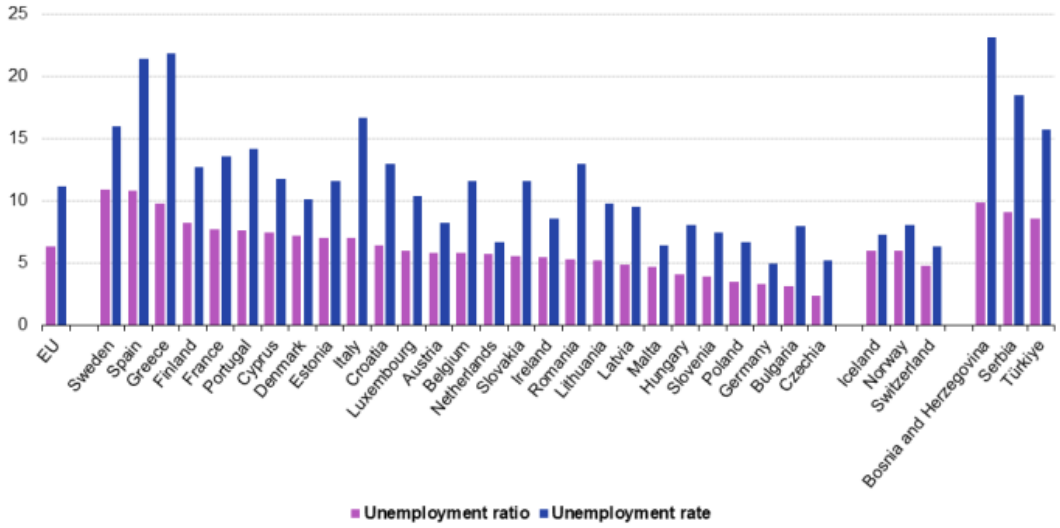

Figure 2. **Youth unemployment 2023**

Source: Eurostat (2024).

Latvia youth unemployment rate for 2023 was 12.50%, a 2.77% p.p. decline from 2022. It was higher than Poland – Poland youth unemployment rate for 2023 was 11.58%, a 0.96% p.p. increase from 2022. The high unemployment rate of young people reflects the challenges they face in searching for employment.

Recognizing the high level of unemployment among young people, it should be emphasized that increasingly, due to the condition of the labor market, workers over the age of 24 continue to undertake educational efforts to enhance their competencies and increase their attractiveness as employees. This is evident in public statistics, as according to EUROSTAT data, in 2023, 10.7% of people aged 25-65 from Latvia and 8.7% from Poland were still participating in education (Eurostat 2024).

Comparing the labor market situation in Poland and Latvia, it can be observed that both the general and regional unemployment rates change over the years, which further justifies the need for constant market monitoring. The high unemployment rate among people aged 18-29, as well as the high percentage of people over 24 still participating in education, may indicate both the need for fundamental changes in the education system aimed at equipping young people with competencies that are in short supply in the market, as well as the justification for increasing professional and spatial mobility in order to adapt to economic conditions (by acquiring new skills, retraining or changing the place of residence) (AbouAssi et al. 2019). The promotion of lifelong learning and the development of professional competencies is considered the right direction for the development of knowledge-based economies, but the alignment of educational programs with the dynamically changing demands of the labor market presents a challenge for universities.

Factors of Employer Attractiveness

Organizations operating in the market are perceived with varying levels of attractiveness by employees. Attractiveness is determined by the ability to meet employees' needs, which change over time and depend on factors such as career stages, family situation, and market conditions (including the unemployment rate). Public, business, and non-profit organizations alike can exhibit high levels of attractiveness by shaping their ability to attract talent through offering specific employment conditions desired from the perspective of key candidates. An essential element of establishing long-term cooperation with an employee, leading to increased retention rates and reduced turnover, is the alignment of employee expectations with the organization's offer. Employee expectations regarding organizations concern various dimensions of attractiveness. A significant number of researchers have focused on the dimensions and factors of attractiveness. Referring to the views of T. Ambler and S. Barrow (1996), the authors distinguished the psychological, functional, and economic dimensions. A more detailed division was presented by Dabirian et al. (2019), emphasizing, among others, the importance of salary, health benefits, holiday subsidies, alternative incentives, free food, etc. Yousf and Khurshid (2021) emphasize the value of competitive compensation as a factor that provides a competitive advantage, conditioning attitudes and behavior at work, leading to employee engagement, while Položki Vokić, Tkalac Verčič and Sinčić Ćorić (2023) show the importance of strategic communication in internal employer branding. The diversity of factors and dimensions indicates the varied needs of employees. It is important to emphasize that the most frequently mentioned attributes of an organization include the level of offered salary, job stability, work atmosphere, the possibility of remote work, opportunities for professional development, and physical working conditions. These attractiveness factors should be of particular interest to organizations, increasing their appeal and the possibility of building an image as an employer of choice. Public, business, and non-profit organizations have different capabilities and needs in shaping these factors, which are conditioned by legal regulations, the purpose of these entities, and the level of difficulty in finding an employee with a specific preferred competency profile.

Results of empirical studies

The empirical research, the analysis of which made it possible to answer the research problem, was conducted on a sample of 276 students. The research was a pilot study, and therefore the results do not allow for generalization to the entire population of the Polish and the Latvian students. However, they provide a basis for comparing the labor market

situation in both countries and highlighting the diversity of student opinions regarding the assessment and factors determining employer attractiveness. The sample structure was described using three basic variables: gender, age, and level/type of studies (Table 1).

Table 1

Structure of the research sample

Country	Criteria	Answers	%	N
Poland	Gender	Women	41.33	62
		Men	58.67	88
	Age	18-22	69.80	104
		23-29	23.49	35
		30 and over	6.71	10
	Level of studies	Bachelor studies	71.33	107
		Master studies	28.67	43
Latvia	Gender	Women	76.19	96
		Men	23.81	30
	Age	18-22	42.85	54
		23-29	31.75	40
		30 and over	25.40	32
	Level of studies	Bachelor studies	59.52	75
		Master studies	25.40	32
		Doctoral studies	2.38	3
		Postgraduate studies	12.70	16

Source: own study results.

The study involved 150 students of the War Studies University from Warsaw, engaged in first (71.33%) and second degree programs (28.67%) at the Faculty of Management and Command. Among the respondents, there were 41.33% women and 58.67% men, with 69.80% of the respondents aged up to 22, 23.49% aged 23-29 and 6.71% of those aged 30 and over. By analyzing the structure of the research sample of students from Daugavpils University, 126 students took part in the survey, and unlike the situation at the War Studies University, there was a significant predominance of women among the respondents (76.19%). This difference can be explained, among other things, by the fact that War Studies University is a civil-military institution, which attracts a larger number of men than women, unlike University in Latvia. The structure of the response thus partly corresponds to the structure of students at both universities (taking into account the studied fields). The Latvian respondents participated in first degree (59.52%), second degree (25.40%), third degree (2.38%) and postgraduate (12.70%) programs, making the age structure quite diverse – 42.85% of students aged up to 22, 31.75% of those aged 23-29 and 25.404% of respondents aged 30 and overtook part in the survey. Respondents participating in the study had work experience. Among the respondents from Poland, 75.63% were employed, while in Latvia, 61.23% were employed.

During the conducted research, to understand respondents' opinions on the national, regional, and local labor market situation, students were asked to express their views using a five-point scale (Table 2).

Table 2

Assessment of the situation on the Polish and Latvian labor markets

Country	Type of market	Definitely bad	Rather bad	Average	Rather good	Very good
Poland	National labor market	3.33%	6.67%	45.33%	41.33%	3.33%
	Regional labor market	4.67%	11.33%	43.33%	35.33%	5.33%
	The labor market in your place of permanent residence	10.67%	23.33%	40.00%	20.00%	6.00%
Latvia	National labor market	3.17%	12.70%	53.97%	27.78%	2.38%
	Regional labor market	10.32%	35.71%	42.86%	9.52%	1.59%
	The labor market in your place of permanent residence	24.60%	41.27%	25.40%	5.56%	3.17%

Note: Question from questionnaire: How do you assess the situation in the labor market?
Source: own study results.

Focusing on the national labor market, 44.66% of the Polish students rated the situation positively. The Latvian students were more skeptical, with only 30.16% giving a positive rating. A similar situation was noted in the assessment of the regional market: 40.66% of the Polish students rated it positively, compared to only 11.11% of the Latvian students. The fewest positive ratings were given for the local labor market (the labor market in the place of residence). In this case, the Polish students also had more positive opinions – 26%, compared to the Latvian students – 8.73%. As many as 65.87% of Latvian respondents rated the local labor market negatively, which can be explained by both the unemployment rate in the Latgale region and the predominance of jobs in this region offered by public employers (including the government sector). It is worth to mention, that the assessment of employers is not synonymous with the assessment of the labor market and the opportunities it creates for employees. In the studied group, Latvian students rated the attractiveness of employers relatively high, but when referring to the situation in the local labor market, i.e., adopting the perspective of a job seeker looking for work matching their qualifications and competencies, they perceived difficulties in finding a job in this market. Considering the research results, it can be stated that the Polish students generally expressed more positive opinions about the labor market – both in terms of national, regional, and local assessments. However, it is noteworthy that young people in both Poland and Latvia are aware of the market situation, and referring back to the public statistics cited in the article, the Polish students have a better outlook for the future.

Knowledge of the labor market situation, combined with career aspirations and self-awareness in terms of competencies, translates into the assessment of different groups of employers – public, business, and non-profit as more or less attractive in the context of future professional prospects. Bearing this in mind, during the research, the respondents were asked to evaluate the attractiveness of three groups of employers.

Table 3

Employer Attractiveness in the Opinion of Surveyed Students

Country	Employers	Definitely low	Rather low	Medium	Rather high	Definitely high
Poland	Public organization	5.33%	18.67%	37.33%	33.33%	5.33%
	Business organization (private)	0.00%	5.33%	24.67%	54.00%	16.00%
	Non-governmental organization (NGOs, charity)	6.00%	17.33%	52.00%	22.67%	2.00%
Latvia	Public organization	2.38%	8.73%	45.24%	33.33%	10.32%
	Business organization (private)	0.00%	6.35%	42.86%	39.68%	11.11%
	Non-governmental organization (NGOs, charity)	11.2%	20.8%	48%	14.4%	5.6%

Note: Question from questionnaire: In your opinion, what is the attractiveness of the mentioned employer groups?
Source: own study results.

The Polish students rated the attractiveness of business organizations the highest – 70.0%. Only 5.33% of respondents had a negative opinion about the attractiveness of these employers. Public organizations were ranked second by the Polish students – 38.66%, with the response structure for this group being relatively balanced across positive, average, and negative ratings. The majority of the Polish students indicated an average level of attractiveness for non-profit employer – 52.0% of respondents. Similar results were also noted in the assessment of these employers by the Latvian students (average level – 48.0%).

Moving on to the response structure of the Latvian students regarding the assessment of public and private employers, it can be seen that the opinions were less varied. 50.79% of respondents had a positive opinion about business employers, while 43.65% expressed a positive view on the attractiveness of public employers. Comparing the results in both countries, the Polish students considered business organizations to be more attractive employers, whereas the Latvian students rated the attractiveness of both public and business employers similarly.

Considering the attractiveness of employer groups, the study also analyzed the key factors of employer attractiveness in the opinion of the Polish and the Latvian students (Table 4).

Table 4

Factors of Employer Attractiveness in the Opinion of Students

No.	Attractiveness factors	Poland	Latvia
1	Amount of remuneration offered	82.67%	53.97%
2	Working atmosphere	80.00%	69.05%
3	Employment stability	67.00%	65.87%
4	Workplace location	66.67%	46.03%
5	Flexible working hours	57.33%	63.49%

No.	Attractiveness factors	Poland	Latvia
6	Working conditions	52.67%	64.29%
7	Offered form of employment (type of contract)	46.00%	18.25%
8	Ability to maintain a work-life balance	44.67%	38.89%
9	Amount of free time after work	37.33%	24.60%
10	Developing passion through work	37.33%	23.81%
11	Possibility to work remotely	33.33%	53.17%
12	Support from superiors	32.67%	37.30%
13	Transparent career path	32.00%	61.11%
14	Various employee benefits	30.67%	50.00%
15	The prestige of the profession	27.33%	20.63%
16	Company image/employer reputation	26.67%	19.84%
17	Improvement of employee competences	25.33%	27.78%
18	The prestige of the workplace	22.00%	20.63%
19	Possibility of early retirement	17.33%	23.81%
20	Social respect for the profession	15.33%	22.22%
21	Content of the work performed (e.g. possibility to help others)	14.00%	7.94%
22	Type of organization (public/social/private)	8.00%	17.46%
23	Performing work that is consistent with your education	5.33%	21.43%
24	Family traditions related to profession/workplace	1.33%	5.56%

Note: Question from questionnaire: How important are the employer attractiveness dimensions listed below to you?
Source: own study results.

Analyzing the research results and comparing the two studied groups, it can be observed that the response structure differed in terms of the frequency of selecting specific factors. The Polish students most often indicated that employer attractiveness is determined by the level of offered salary, work atmosphere, stability of employment, and workplace location. The Latvian students, on the other hand, emphasized the value of work atmosphere, job stability, working conditions, and flexibility of working hours. The greatest discrepancies in assessments concerned the following factors:

- A clear career path was important for 61.11% of the Latvian students and only 32.0% of the Polish students;
- The possibility of remote work was indicated as an attractiveness factor by 53.17% of the Latvian respondents and 33.33% of the Polish respondents;
- Workplace location was an important factor for 66.67% of the Polish students and 46.03% of the Latvian students;
- The offered form of employment was important in the opinion of 46% of the Polish students and only 18.25% of the Latvian students.

Factors with low attractiveness, according to both groups, included family traditions related to working in a profession/organization, the content of the work performed, and the type of organization. It is also worth noting that for young people, developing passions through work is more important than the possibility of developing competencies within organizations.

Summary

The labor market situation in Poland and Latvia is improving year by year, although regional disparities and generally negative assessments of the local labor markets situation are still visible. The assessment of the local labor market by respondents in Poland, on the one hand, may result from labor market indicators, which vary across the country, but in recent years at the national, regional, and local levels have indicated improvement. On the other hand, the respondents in the study were educated in the voivodeship with the highest GDP in Poland. Thus, their perspective may result from positive assessments of the labor market in Warsaw and the neighboring towns. In the case of Latvia, statistics also indicate improvement in recent years. However, the respondents were educated in the Latgale region, where the labor market situation is more challenging compared to the Riga region, for example. Therefore, their assessments of this market reflect the difficulties encountered in finding jobs appropriate to their acquired qualifications. The increase in the percentage of people participating in education after the age of 24 allows us to assume that in order to adapt and find place in the market many workers need to acquire new competencies, improve existing ones, and increasingly make efforts towards professional retraining. The promotion of lifelong learning and the development of professional competencies is considered the right direction for the development of knowledge-based economies. However, due to intense economic competition, the attractiveness and adequacy of educational programs to the needs of the labor market are crucial for maintaining the standard of living in Central and Eastern European countries. Universities, like other educational institutions, should make special efforts to equip young people with market-relevant competencies and skills to navigate the labor market, including job searching. Organizations, in turn, aiming to attract employees with a specific competency profile, should primarily conduct detailed research on employee needs and the possibilities of meeting them by offering specific employment conditions.

As the research shows, each group of organizations – business, public, and non-profit, is considered attractive employers by a specific group of students. In Poland, business organizations are perceived as more attractive, which is also reflected in the most frequently indicated attractiveness factor by the Polish students, namely the level of offered salary. Different responses were obtained during the survey of the Latvian students. The students similarly rated the attractiveness of public and business employers (a difference of 7.14 percentage points), emphasizing the importance of work atmosphere and job stability as significant attractiveness factors. Salary level ranked only sixth in the list of factors.

In conclusion, the opinions of the Polish and the Latvian students on the labor market situation and employer attractiveness in both countries are diverse. Conducting research on this topic has allowed for presenting the perspective of future employees, thus providing insight into the challenges young people face. Since the research was not conducted on representative samples, the results suggest the need for further studies in this area, not only in Poland and Latvia, which would allow for a better understanding of the youngest generation’s perspective and thus build an attractive employment offer for the youngest talents in the market.

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Situācija darba tirgū Latvijā un Polijā un darba devēju pievilcība studentu skatījumā

Kopsavilkums

Rakstā ir izklāstīti teorētisko un empīrisko pētījumu rezultāti par situāciju Polijas un Latvijas darba tirgos un darba devēju pievilcību abās valstīs no studentu skatupunkta. Empīriskais pētījums tika veikts no 2023. gada decembra līdz 2024. gada janvārim (Kara studiju universitātē Polijā un Daugavpils Universitātē Latvijā), izmantojot diagnostiskās aptaujas metodi 276 studentu izlasei (150 studenti no Polijas un 126 studenti no Latvijas). Pētījums parādīja, ka studenti abās valstīs visaugstāk vērtē valsts darba tirgus situāciju. Vienlaicīgi, vietējā darba tirgus situācija studentu pastāvīgās dzīvesvietas apgabalā tika

novērtēta viszemāk. Polijas studenti augstāku pievilcības līmeni dod privātajiem darba devējiem, atšķirībā no Latvijas studentiem, kuri gan valsts, gan privātos darba devējus uzskata par diezgan pievilcīgiem. Gan Polijas, gan Latvijas studentu skatījumā darba devēja pievilcību nosaka darba stabilitāte un darba gaisotne, no kuriem svarīgākais faktors studentiem Polijā ir alga, savukārt, Latvijā par būtisku studenti uzskata arī darba apstākļus un skaidru karjeras ceļu.

Atslēgas vārdi: darba tirgus, darba devēja pievilcība, studentu perspektīva.

Iwona Lasek-Surowiec (Poland)

THE DIGITAL EURO AND PRIVACY

The article examines the legal challenges related to the introduction of the digital euro by the European Central Bank (ECB), with a focus on the protection of users' privacy. The research aims to explore how to balance data protection rights with public interests, particularly under European Union regulations such as the General Data Protection Regulation (GDPR) and Anti-Money Laundering/ Counter-Terrorism Financing (AML/CTF) directives. Key tasks include analyzing the technological, legal, and social implications of the digital euro, particularly regarding its integration into the current financial system. The main problem addressed is the potential conflict between ensuring financial security and protecting individual privacy. The novelty of the research lies in its holistic approach to identifying and proposing solutions for these challenges, including the concept of "limited anonymity" and advanced cryptographic methods. The main conclusions emphasize the need for a system that harmonizes privacy protection with regulatory requirements, ensuring the success of the digital euro as a modern financial instrument.

Key Words: Digital euro, privacy protection, Central Bank Digital Currency (CBDC), GDPR, AML/CTF.

Introduction

The issue of the introduction of the digital euro by the European Central Bank (ECB) fits into the current discourse on the development of digital central bank currencies (CBDC), which are a response to the changing needs of the modern digital economy. The digital euro, the ECB's proposed form of money, aims not only to promote financial stability and make electronic payments more accessible, but also to adapt financial systems to the requirements of modern technologies. However, this initiative raises numerous legal questions and challenges, especially in the protection of the privacy of European Union (EU) citizens.

Financial privacy is one of the key values guaranteed by the EU legal order, including Article 8 of the Charter of Fundamental Rights of the European Union (The Charter of EU Fundamental Rights 2007/303) and the General Data Protection Regulation (Regulation (EU) 2016/679, Directive 95/46/EC).

In accordance with applicable law, any form of processing personal data, including those related to financial transactions, should comply with the principles of legality, transparency, purpose limitation and data minimization. However, the introduction of the digital euro as a potentially universal payment tool poses a risk of violating these rules, especially in the context of the need to comply with AML (Directive (EU) 2018/1673; Regulation (EU) 2024/1620) and Counter-Terrorism financing (CTF) regulations.

On the one hand, the CBDC should offer solutions to ensure the anonymity of users' transactions, which is one of the cornerstones of financial privacy. On the other hand, complete anonymity could lead to abuse, including facilitating criminal activities. In this context, the key legal challenge is to develop a mechanism that balances public interests, such as financial security, with the protection of individual rights, in particular the right to privacy.

In addition, the digital euro fits into a broader technological context, including the use of solutions such as blockchain, tokenization or advanced cryptographic technologies (European Central Bank 2019). The technology that enables the digital euro to function effectively can also increase the risk of data security and privacy breaches, which requires additional legal guarantees. An important aspect is also the ability to supervise transactions in real time, which in some cases may lead to excessive interference with citizens' autonomy.

The article aims to analyze the legal challenges related to the introduction of the digital euro by the ECB, with particular emphasis on the protection of user privacy. The study focuses on finding a balance between financial security, compliance with regulations (such as the GDPR and the AML/CTF Directives) and an individual's right to privacy. The author draws attention to the technological, legal and socio-economic consequences of the digital euro, proposing solutions such as limited anonymity and advanced cryptographic methods that can help solve these challenges.

In a social context, the digital euro is intended to provide a universal and secure means of payment, accessible to all citizens, including those deprived of access to private banking services. This can contribute to increasing financial inclusion and improving the digital competences of society. However, the issue of privacy protection and the possibility of excessive state supervision may affect the level of public trust and acceptance of this solution. In addition, the digital euro can change citizens' financial habits by limiting the use of cash for digital forms of payment.

In legal terms, the introduction of the digital euro must comply with EU regulations, in particular the GDPR on personal data protection and anti-money laundering and terrorist financing regulations. The key challenge remains to find a balance between the anonymity of transactions and the need to provide regulatory oversight to prevent financial crime. The ECB and EU legislators are faced with the task of developing a legal framework that will guarantee the security of the system without undue state interference in the privacy of users.

In economic terms, the digital euro can strengthen the stability of the financial system by offering an alternative to private payment systems. Its introduction will also contribute to increasing the financial sovereignty of the EU by reducing dependence on global corporations dominant in the area of digital payments. However, there are also potential risks, especially for commercial banks – the massive adoption of the digital euro could lead to the outflow of deposits, which would affect their liquidity and lending capacity.

Digital euro – definition and functions

The digital euro is a designed form of digital money issued by the ECB, responding to the challenges of the modern digital economy (Beerbaum 2024; Dissaux, Kalinowski 2023). In a legal sense, the digital euro would be an official means of payment, equivalent to cash and bank money, which would mean that every citizen and economic operator in the euro area would have the right to accept them in settlements. Unlike other forms of digital money such as cryptocurrencies or stablecoins, the digital euro would be fully state-backed and covered by the stability and confidence guarantee provided by the ECB. First of all, its value would not be subject to significant market fluctuations, which is typical of private currencies such as Bitcoin, and thus would eliminate the risk of speculation. The aim of the digital euro is to facilitate safe and efficient transactions, while ensuring financial stability and protecting consumer interests. CBDC can be considered as a tool to complement, not replace, a functioning financial infrastructure. The ECB clearly indicates (Næss-Schmidt et al. 2023) that the digital form of the euro is only intended to supplement cash, not to push it out, reflecting its commitment to ensuring pluralism of payment methods in the economy.

The ECB points out several key objectives and targets for the introduction of the digital euro (Westermeier 2024). First, it is to ensure financial stability. The introduction of the digital euro aims to strengthen financial stability in the euro area by reducing risks associated with private payment systems that may be susceptible to disruptions, such as technological failures, loss of trust in the issuer or lack of regulation. The CBDC, whose value

is based on the credibility of the ECB, provides users with an alternative in the event of market crises.

The second objective is to ensure the universal availability of digital payments. The digital euro will be available to all euro area citizens, regardless of their financial or technological status. In the context of the increasing digitalisation of payment systems, there is a risk of excluding people who for various reasons cannot use private payment systems. The introduction of a digital euro, which is a public good, would counteract this phenomenon and guarantee equal access to modern forms of payment. Another objective is to increase EU financial sovereignty, including reducing dependence on external, unsupervised payment systems, such as global technology corporations offering their own forms of digital money. The introduction of the digital euro is intended to strengthen the independence of the European financial system and ensure full control over the circulation of money in the euro area (European Central Bank 2020). The fight against financial crime is also an important aspect. Thanks to the use of modern supervisory technologies, the digital euro will enable more effective monitoring of transactions in terms of counteracting money laundering and terrorist financing, while ensuring privacy protection in accordance with the principles of the GDPR.

At the same time, it should be stressed that the purpose of the CBDC in its current legal form is not to eliminate other forms of money, in particular cash (European Central Bank 2023 a, b). Cash is a traditional form of money issued by a central bank, characterized by full anonymity of transactions and the lack of the need to mediate financial institutions. The digital euro may not provide full anonymity, which is due to the need to monitor transactions for regulatory purposes. Nevertheless, it has an advantage in terms of convenience of use, especially in cross-border trading, and security of transactions that will be secured by cryptographic technologies. Bank money, i.e. funds held in commercial bank accounts, is widely used in electronic transactions. However, unlike the digital euro, bank money is subject to the risk of insolvency of a financial institution. The digital euro, which is a direct commitment of the central bank, eliminates this risk, making it a more secure tool for storing value in times of financial crises. Cryptocurrencies, in turn, are decentralized forms of digital money, the issuance and trading of which takes place without the participation of central institutions. The main difference between cryptocurrencies and the digital euro lies in their regulation – while cryptocurrencies operate in an unattended environment, the digital euro will be fully controlled by the ECB (Makarov, Schoar 2022). This means that the digital euro combines the advantages of modern technologies with the credibility and stability provided by a public institution. Stablecoins are digital private currencies whose value is linked to a specific underlying asset, such as fiat currency. As with cryptocurrencies, stablecoins are issued by private entities, which involves limited regulatory control (Financial Action Task Force 2020). The digital euro distinguishes it from stablecoins by the fact that it is directly supported by the state/EU, which ensures greater stability and trust.

The digital euro is therefore a form of money that combines the features of traditional cash, bank money and modern technologies used in cryptocurrencies and stablecoins, while ensuring full compliance with legal regulations. This gives it the opportunity to play a key role in the future EU financial system.

The importance of privacy protection in the digital euro system

In the digital age, where information and communication technologies (ICT) play a key role, privacy is becoming a priority for both individuals and public institutions. Every

natural person has the right to the protection of their personal data (Regulation (EU) 2016/679, Directive 95/46/EC). In the context of the digital euro, this means that the ECB and other actors involved in the system must ensure compliance with the principles of personal data protection, including the principle of data minimization, purpose limitation, transparency and data protection.

The introduction of the digital euro will require the use of advanced technologies such as blockchain, distributed ledgers (DLT) and cryptographic systems (Beerbaum 2024). These technologies, while providing a high level of security, can also pose a challenge in terms of protecting your privacy. In particular, consideration should be given to methods to ensure:

a) *Anonymity of transactions* – unlike traditional cash, digital euro may require user identification to ensure compliance with anti-money laundering and counter-terrorist financing rules; The ECB should endeavor to maintain the highest possible level of anonymity of transactions, in accordance with the principle of proportionality.

b) *Personal data management* – in the euro digital system, personal data management mechanisms should be introduced to ensure their minimization, limitation of purpose and protection against unauthorized access; the ECB may consider techniques such as pseudonymisation, data encryption and data recall mechanisms.

c) *Access control:* the digital euro system should provide control of access to personal data, both for ECB staff and for external entities such as payment service providers; this requires the implementation of appropriate security procedures and policies (World Bank Group 2021).

In order to increase public acceptance of the digital euro, it will be necessary to carry out educational campaigns on rights and obligations related to the protection of personal data and how to manage privacy in the system (Krüger, Busche 2023). In the context of globalization and the integration of financial markets, the protection of privacy in the digital euro system requires international cooperation and harmonization of standards and regulations.

The protection of privacy in the digital euro system is a key challenge that requires an integrated approach combining legal, technological and socio-economic aspects. The ECB, as the issuer of the digital euro, must ensure that the system complies with data protection rules while maintaining a balance between security and user privacy (European Central Bank 2023 a, b; Rada Europejska. Rada Unii Europejskiej 2023). Innovative technological solutions, public education and international cooperation are essential to create a digital euro system that is both secure and respectful of the individual's rights to privacy. Citizens' confidence in the digital euro will be crucial to its success as a means of payment.

The ECB should put in place legal and technological solutions that ensure a balance between the protection of privacy and the implementation of supervisory requirements. The recommended actions include, first, the introduction of a model of "limited anonymity", which allows transactions to be identified only in cases justified by AML/CTF regulations (Bank for International Settlements 2022). In addition, it is postulated to use advanced cryptographic technologies to protect personal data of users. It is necessary to lay down clear rules for the storage and retention of transaction data, in line with the principle of minimization. Users will also need to be educated on the protection of privacy and the functioning of the digital euro, which will increase awareness and trust in the system (Dowd 2024).

The introduction of the digital euro represents an important step toward the digital transformation of the EU financial system. However, for this system to be effective and socially acceptable, it must take into account the importance of privacy protection as a fundamental right of the individual. Ensuring an adequate level of protection of personal

data and user privacy is not only a legal requirement, but also a key factor in the success of the digital euro as a modern form of money.

Legal challenges related to privacy protection

The digital euro has generated numerous discussions not only in a technological and economic context, but also in a legal context. EU data protection legislation require (The Charter of EU Fundamental Rights 2007/303; Regulation (EU) 2016/679, Directive 95/46/EC) that data processing be carried out in accordance with the principles of legality, purpose, data minimization and transparency. The digital euro issued by the central bank must take these principles into account at every stage of the design and operation of the system. Particular attention should be paid to the lawfulness of data processing: The ECB and other institutions involved in the operation of the digital euro must demonstrate the legal basis for the processing of user data, particularly where this data is used for financial supervision purposes. Respect for the principle of data minimization is essential: The digital euro system should be designed in such a way that data processing is limited to the absolutely necessary information, in accordance with the principle of 'privacy by design' (Regulation (EU) 2016/679, Directive 95/46/EC). The rights of users should also be taken into account – digital euro users should be able to exercise their full rights provided for in the GDPR, such as the right to access, rectify and delete data (Regulation (EU) 2016/679, Directive 95/46/EC), to the extent that this does not affect the functioning of the system.

At the same time, the digital euro system must comply with the requirements of EU anti-money laundering and anti-terrorist financing rules. These requirements include the need to identify users and monitor transactions to detect and prevent criminal activity.

The fundamental problem lies in the conflict between the desire to ensure anonymity for digital euro users and the need to carry out supervisory duties. On the one hand, anonymity of transactions is crucial for protecting users' privacy, on the other hand, lack of identification in transactions can lead to abuses such as money laundering or terrorist financing.

In this context, the ECB and EU legislators are facing the challenge of developing a model that ensures limited anonymity (users should be able to carry out small transactions anonymously, while retaining traceability in the case of high value transactions or suspected illegal activities) and proportionality of supervision – the monitoring of transactions should be proportionate to the purpose, in accordance with the purpose limitation principle set out in Article 5 of the GDPR (Regulation (EU) 2016/679, Directive 95/46/EC).

Setting the line between anonymity and traceability of transactions in the digital euro system is crucial to reconcile privacy protection with regulatory requirements. Possible solutions in this respect include: a) tokenization of transactions – the use of tokens allows for the execution of payments without disclosing the user's personal data, while maintaining the possibility of identification in cases justified by law; b) privacy technologies, such as ZKP, allow the verification of the identity or validity of transactions without the need to disclose user details and c) a layered model – in which anonymity is guaranteed for small transactions, while high-value transactions require full user identification (Murphy et al. 2024).

The digital euro can significantly affect the sovereignty of users' data, defined as control over how their personal data is processed and used. One of the risks associated with the digital euro is the potential centralization of data in the hands of the ECB or other public institutions, which could lead to an increased risk of privacy breaches.

In order to address these risks, clear rules on access to data should be defined: User data should be accessible only to authorized entities and in strictly defined situations. Sec-

ondly, it will be necessary to use decentralized technological solutions, as decentralization of data processing can increase system security and reduce the risk of fraud. The interoperability of the system should be guaranteed, thus allowing users to transfer data between different payment service providers in a manner consistent with the principle of the right to data portability (Regulation (EU) 2016/679, Directive 95/46/EC).

The protection of privacy in the digital euro system is therefore a key challenge, both from the perspective of users and the legal and economic stability of the European Union. When designing the digital euro, a balance needs to be struck between the protection of personal data and the implementation of supervisory requirements such as AML and CTF. The ECB should put in place legal and technological mechanisms to ensure that the euro digital system complies with Union values and regulations. The priority must be to minimize data processing and to provide users with full control over their personal data, while maintaining the ability to prevent fraud. Ultimately, this responsible approach to privacy will determine the success of the digital euro as a next-generation payment tool.

Ensuring an adequate level of anonymity in CBDC transactions is at the heart of the debate on the digital euro. The privacy of EU citizens is a fundamental right (The Charter of EU Fundamental Rights 2007/303; The Treaty on the Functioning of the EU 2016/C, 202/01). In digital systems, such as CBDC, it is necessary to develop technological solutions that meet these requirements (Groß et al. 2021; Oude Roelink et al. 2024; European Central Bank 2021; European Central Bank 2014).

An important aspect of the implementation of the digital euro is the need to design it from a technical point of view at a level that minimizes the risks of cyber attacks and personal data and privacy breaches. These risks are increasing with the digitalisation of financial systems. In the light of the GDPR and the EU NIS Directive (Directive (EU) 2022/2555, EU Regulation No 910/2014, EU Directive 2018/1972, EU Directive 2016/1148), CBDC systems must be designed to minimize the risk of personal data breaches and system disruptions (Directive (EU) 2022/2555, EU Regulation No 910/2014, EU Directive 2018/1972, EU Directive 2016/1148).

The digital euro is an important step in the transformation of the European financial system, but its implementation requires a responsible approach to protecting privacy and data security. Technologies such as ZKP, private blockchains and advanced cryptographic mechanisms can play a key role in ensuring compliance with EU legislation such as the GDPR (Regulation (EU) 2016/679), the AMLD6 Directive (Directive (EU) 2018/843) and the NIS Directive (Directive (EU) 2022/2555, EU Regulation 910/2014, EU Directive 2018/1972, EU Directive 2016/1148). Further research and cooperation between regulators, technologists and lawyers will be needed to ensure that the digital euro meets the expectations of both citizens and financial institutions.

Supervision of the implementation and functioning of CBDC and privacy

CBDC is an initiative that aims to create a digital form of currency based on trust in the central bank. However, the introduction of this payment instrument requires detailed supervision to ensure compliance with EU legislation, security of the system and protection of citizens' rights.

The ECB is responsible for the issuance of money and the stability of the financial system in the euro area (The Treaty on the Functioning of the EU 2016/C 202/01). The ECB shall act as the overarching body for the design of the system architecture, in particular the development of technical and legal mechanisms to ensure compliance with Union law and cooperate with national central banks to coordinate activities at Member State level.

Member States' central banks are required to adapt their financial systems to the ECB's requirements while respecting national regulations. Cooperation between the ECB and national banks is crucial for the successful implementation of the digital euro. In addition to the ECB and national banks, the supervision of the digital euro requires the involvement of the European Securities and Markets Authority (Regulation 1095/2010 establishing ESMA) in the supervision of financial markets, the European Banking Authority (Regulation 1093/2010 establishing EBA) – for financial security and AML/CFT compliance and the European Union Agency for Cybersecurity (Regulation 2019/881 on ENISA) – to ensure the technological security of the payment system.

The protection of privacy is a key legal requirement in the digital euro project. This means the need to implement privacy protection technology in the field of pseudonymisation and anonymisation of transaction data and verification of users' identity only in cases justified by law.

The ECB and other supervisory authorities are required to monitor the impact of the digital euro on financial stability. The risk that the digital euro will replace deposits with commercial banks should be avoided, which could destabilize the banking system. Potential threats include cyber-attacks, which necessitate procedures that comply with the NIS2 Directive (Directive (EU) 2022/2555) and the cybersecurity legislation as well as personal data breaches – in this case, transaction processing systems must be secured against unauthorized access.

One of the biggest challenges is to reconcile regulatory oversight with the protection of users' privacy. Concerns include the possibility of mass tracking of transactions by state institutions and the risk that supervision of the digital euro will lead to restrictions on civil liberties.

The effective introduction of the digital euro requires citizens' trust in the system. A key element is to ensure that users' data is adequately protected and that their privacy is not compromised.

The ECB and the national banks will be responsible for day-to-day supervision of the functioning of the euro digital system. In particular, this will include monitoring transactions to detect potential fraud and ensuring the availability and liquidity of the payment system. In the supervision of the digital euro, technologies such as blockchain and artificial intelligence can be used.

The introduction of the digital euro will also require cooperation at international level, in particular on the harmonization of regulation of digital currencies with other jurisdictions and the exchange of information on threats related to cybercrime.

Supervision of the introduction and operation of the digital euro is a multidimensional challenge that requires close cooperation between EU institutions, national central banks and regulators. Compliance with EU law, protection of users' privacy and ensuring the technological security of the system are crucial. The adoption of a "limited anonymity" model and the use of advanced technologies can be effective tools in achieving these goals. Effective supervision will be the foundation of social trust and financial stability in the new era of the digital economy.

The digital euro, as a public means of payment, requires a balance between individual rights and public interests. In this context, it is crucial to include privacy protection as an individual's right, since the right to privacy is the foundation of a democratic society, as reflected in the GDPR and the case law of the Court of Justice of the EU (e.g. Case C-311/18). Users of the CBDC system have the right to protect their personal data, which requires the implementation of data minimization principles, i.e. collecting only the necessary information and designing systems in accordance with the principle of privacy protec-

tion from the beginning of their creation. At the same time, it should be stressed that the public interest requires that the CBDC payment system be safe and fraud-proof.

The common denominator for privacy protection and supervision is the principle of proportionality, according to which supervisory measures should be adequate, necessary and not affecting the essence of individual rights (The Charter of EU Fundamental Rights 2007/303). An example is the implementation of selective supervision of high-risk transactions, rather than monitoring all users. The compromise between full anonymity and total surveillance is the model of "limited anonymity." This approach implements technical and legal mechanisms that ensure the privacy of most transactions, while allowing supervision in cases requiring intervention. The "limited anonymity" model requires addressing a number of regulatory harmonization challenges. Firstly, it would require the need to align national laws with EU uniform regulations and the trust of users, which would involve the development of transparent procedures that build trust in the system. Thirdly, it would be reasonable to clearly define the liability for possible breaches of privacy.

Balancing privacy and surveillance in the context of the digital euro requires an innovative approach that takes into account both the needs of citizens and the requirements of public security. The model of "limited anonymity" is a compromise that can reconcile the protection of privacy with effective supervision, while respecting individual rights and the public interest. The implementation of such solutions requires close cooperation between legislators, technologists and financial institutions to ensure efficiency, legal compliance and public trust in the digital euro.

Summary

As a digital form of money issued by the ECB, CBDC aims to support financial stability, ensure the availability of digital payments to the public and to make the EU independent of private payment systems. However, the implementation of this solution requires reconciling two key aspects - the right to privacy of users with the obligation to prevent money laundering and terrorist financing and the supervision of transactions. To this end, a model of "limited anonymity" is proposed, in which small transactions remain anonymous, while those of higher value are identifiable.

The digital euro system, based on advanced cryptographic technologies, would protect users' personal data while ensuring compliance with regulatory rules. The digital euro offers, in principle, more convenience, although it does not provide complete anonymity. It also differs from cryptocurrencies that operate in a decentralized and unsupervised environment, and from stablecoins that are tied to private assets – the digital euro stands out for its support and stability provided by the state.

The implementation of this system involves a number of challenges, including the need to create mechanisms to minimize the processing of personal data, as well as provide advanced security against cyber attacks. Building social trust is also crucial, which requires transparency and user education. The digital euro is a strategic step for the EU, which requires international cooperation, regulatory harmonization and an integrated approach combining legal, technological and socio-economic aspects.

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Digitālais euro un privātums

Kopsavilkums

Rakstā tiek aplūkotas juridiskās problēmas, kas saistītas ar Eiropas Centrālās bankas digitālā euro ieviešanu, īpašu uzmanību pievēršot lietotāju privātuma aizsardzībai. Pētījuma mērķis ir izpētīt, kā līdzsvarot datu aizsardzības tiesības ar sabiedrības interesēm, jo īpaši saskaņā ar Eiropas Savienības noteikumiem, piemēram, Vispārīgo datu aizsardzības regulu un Noziedzīgi iegūtu līdzekļu legalizācijas/terorisma finansēšanas novēršanas direktīvām. Galvenie uzdevumi ietver digitālā euro tehnoloģisko, juridisko un sociālo seku analīzi, jo īpaši attiecībā uz tā integrāciju pašreizējā finanšu sistēmā. Galvenā aplūkotā problēma ir potenciālais konflikts starp finansiālās drošības nodrošināšanu un indivīda privātuma aizsardzību. Pētījuma novitāte atklājās tā holistiskajā pieejā šo problēmu identificēšanai un risinājumu piedāvāšanai, tostarp "ierobežotas anonimitātes" koncepcijā un progresīvās kriptogrāfiskās metodēs. Galvenie secinājumi uzsver nepieciešamību pēc sistēmas, kas saskaņo privātuma aizsardzību ar normatīvajām prasībām, nodrošinot veiksmīgu digitālā euro kā mūsdienīga finanšu instrumenta darbību.

Atslēgas vārdi: digitālais euro, privātuma aizsardzība, Centrālās bankas digitālā valūta (CBDC), Vispārīgā datu aizsardzības regula, Noziedzīgi iegūtu līdzekļu legalizācijas/terorisma finansēšanas novēršanas direktīvas.

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NAVIGATING THE ROAD OF START-UPS IN LATVIA AND THE PHILIPPINES: A MULTI-CASE STUDY OF ENTREPRENEURIAL EXEMPLARS

Start-ups are newly established businesses founded by entrepreneurs who aim to create and develop new offerings for the market and to drive economic growth. It focuses on features of industries through innovative tools, strategies, and business models. However, limited studies have been conducted to explore the plight of start-up players, unearthing their thoughts and challenges as they navigated the course of entrepreneurship since not all are trained and exposed to become one, hence this study. The methodology of this study is a multi-case design, a tradition of qualitative research that focuses on exploring, analyzing, and presenting the narratives of selected startup champions from the Philippines and Latvia. The purpose of the inquiry is to learn and understand the similarities and differences in the plight of the entrepreneurs, to find business insights and best practices that can be proposed and advocated in both countries, thus helping existing and would-be startups to prosper in the business world. The study revealed that the themes to describe the challenges experienced by founders are: funding remains a critical challenge, flexibility in market adaptation is essential, team-building or outsourcing is crucial for growth, and competition drives differentiation and innovation. The themes emerged regarding key insights and lessons drawn by the founders: resilience is critical in overcoming adversity, networking is essential for growth and opportunities, adaptability is critical for navigating market changes, and efficient resource management is necessary for the success. Lastly, it was found that startups in both countries share common challenges, strategies, and reflections insofar as operating business is concerned. Both sourced their capitalization from personal savings and loans; they first focused on the local market, established their niche, and scaled their way to a regional or global scale. It was noted that Latvian founders are targeting the regional market, while Filipino founders envision penetrating the global industry.

Keywords: business, start-ups, entrepreneurial skills, multi-case, Philippines, Latvia.

Introduction

Start-ups, essential for innovation and economic growth, face several obstacles in the Philippines' and Latvia's entrepreneurial ecosystems. Entrepreneurs in these countries encounter institutional and resource-related barriers that restrict their ability to develop and prosper. Lack of funding, inefficient regulatory frameworks, and the need for solid infrastructure remain barriers for early-stage businesses in the Philippines. These challenges are exacerbated by the limited reach of start-up support networks, particularly in rural areas where entrepreneurs struggle to find market access and skilled labor (Colombo et al. 2006). Despite the Philippines' large, youthful population and growing demand for digital services, start-ups struggle to leverage available opportunities due to these structural weaknesses.

On the other hand, while offering a more developed entrepreneurial environment, Latvia still needs to overcome barriers related to fast-paced technological advancements, which require continuous innovation from start-ups to stay competitive. Many Latvian entrepreneurs struggle to keep up with rapid technological shifts due to resource constraints. The high costs associated with adopting emerging technologies, such as artificial intelligence and blockchain, place significant pressure on regional start-ups, especially those with limited capital and technical expertise (Giones et al. 2020).

Despite differing economic contexts, start-ups in Latvia and the Philippines share everyday experiences within the global entrepreneurial ecosystem, particularly regarding challenges and opportunities. As a member of the European Union, Latvia offers start-ups several advantages, including a comparatively sophisticated regulatory environment, access to EU funding, and a developing tech sector (European Commission 2024).

However, many Latvian entrepreneurs still need to overcome barriers related to high competition, resource limitations, and the need for constant technological innovation.

Furthermore, a significant challenge has been identified: the psychological toll of navigating such a competitive and high-stakes environment, with many start-up founders reporting high-stress levels and burnout (Stephan et al. 2023).

This study subjected two successful start-up founders to inquiry and analysis. Two were from the Philippines, and two were from Latvia, as they met the requirements. The multi-case study design aims to explore and understand the startup founders' challenges, strategies, and insights in their entrepreneurial journeys. Specifically, it aims to answer the following questions:

1. What entrepreneurial challenges were encountered and strategies employed by the start-up founders in the Philippines and Latvia?
2. What key insights and lessons can be shared by the start-up founders to the business community about their entrepreneurial experiences?
3. What similarities and differences can be drawn from each case in the Philippines and Latvia?
4. What explains the similarities and differences of each case?

The study is anchored on the Effectuation Theory by Sarasvathy (2008), which provides a foundation for understanding how entrepreneurs in the Philippines and Latvia make decisions and navigate uncertainty. Sarasvathy's seminal work on effectuation, initially published in 2008 and revised in 2019, provides a robust theoretical framework for understanding entrepreneurial decision-making under uncertainty. Effectuation focuses on affordable loss, where entrepreneurs limit the amount they are willing to lose while taking calculated risks. This is particularly relevant in both countries as start-ups often face resource constraints and high levels of uncertainty.

Moreover, the study has a global significance as it likely addresses the United Nations Sustainable Development Goals (UN SDGs) number 1 (No Poverty) and number 8 (Decent Work and Economic Growth), particularly in developing countries like the Philippines. SDG 1 aims to eradicate poverty by promoting inclusive economic growth and equal opportunities. Start-ups are critical in creating jobs and stimulating local economies (United Nations 2020). As entrepreneurs innovate and create new businesses, they address market needs and provide employment opportunities, contributing to poverty alleviation. In the process, they drive and propel economic activities and growth for all local and global economies.

Research Participants

This multi-case qualitative study involved four start-up founders, two from the Philippines and two from Latvia, who met specific inclusion criteria. The Filipino participants were selected based on their success in technology, e-commerce, and social enterprises. These founders have overcome typical resource constraints in developing economies by leveraging local community networks, government initiatives (e.g., the Innovative Start-Up Act, RA 11337), and creative problem-solving strategies.

Conversely, the Latvian participants are founders of service-oriented start-ups that have benefited from EU funding, enhanced infrastructure, and robust networking within the EU framework. Despite challenges posed by the competitive EU market, these entrepreneurs have achieved steady growth by leveraging institutional support and regional policies (Powell, DiMaggio 2023). Inclusion criteria required that participants have operated their businesses for three to five years. This period provides insight into the

strategic decisions made during the critical early growth phase. At the same time, founders with less than three or more than five years in operation were excluded to maintain focus on early-stage entrepreneurial challenges.

Materials and Instrument

The materials and instruments for this study include semi-structured interviews, case study protocols, and surveys designed to gather rich, qualitative data from the selected start-up founders. These research tools were meticulously created based on the literature and methodologies used in related studies, particularly those that highlighted entrepreneurial hurdles and start-up success (Prashantham et al. 2019; Powell, DiMaggio 2023). The semi-structured approach allowed for flexibility, ensuring that important topics regarding start-up challenges, strategies, and success factors were thoroughly explored. Interview questions focused on various aspects of the entrepreneurial journey, such as financing strategies, team-building, industry selection, and the viability of business ideas. For example, interview themes were grouped around the early stages of starting a business, overcoming obstacles, leveraging technology, resilience, and the influence of mentors. Sample questions included: “What elements influenced your startup’s market or industry choice?” and “What factors contributed to the feasibility of your company idea?” These questions were designed to shed light on the critical decisions made by business owners.

Additional questions examined how founders addressed operational problems, overcame unforeseen obstacles and adapted their strategies in response to changing circumstances. Other questions focused on leadership and how founders motivated their teams, maintained open-mindedness in problem-solving, and used past experiences to refine business procedures. Moreover, further inquiries delved into lessons learned, the role of insights in reshaping business strategies, and the critical success factors for start-ups, such as: “What are the most important lessons you have learned about starting and growing a business?” and “How might other founders avoid or mitigate some of the challenges you faced?” Mobile phone audio recordings were used to capture these in-depth interviews, enabling a comprehensive analysis of the critical tactics and attitudes influencing business performance in Latvia and the Philippines.

Design and Procedure

A multi-case qualitative research design was employed to investigate start-up founders' experiences, challenges, and strategies in the Philippines and Latvia. Data collection involved semi-structured interviews with two founders from each country. Interviews with the Philippine participants were conducted virtually via platforms such as Zoom or Microsoft Teams due to geographic constraints, while interviews with Latvian participants were held in person. All sessions were audio-recorded (with informed consent) and later transcribed for systematic analysis.

The interview protocol, adapted from established guidelines initially published in 2008 and revised in 2019, covered industry selection, operational strategies, and approaches to overcoming challenges. The data were then analyzed to extract common themes and derive insights into the founders’ entrepreneurial journeys.

Results and Discussion

The results from participants in Latvia and the Philippines show the various obstacles and tactics entrepreneurs use to get through startup environments. To outrage operational

and financial barriers and use local networks and resources to maintain growth, Latvian entrepreneurs emphasized the significance of cooperation, government assistance, and market flexibility. Similarly, in good relations with operational management, market rivalry, and finance scarcity, Philippine entrepreneurs strongly emphasized resilience, purpose-driven leadership, and strategic collaborations. Their focus on creation, adaptation, and guiding principles to their hardships and efforts to be firm despite resource constraints and shifting market conditions. The dynamic and complex character of entrepreneurial ventures across many cultural and economic situations is reflected in these shared experiences.

Table 1

Entrepreneurial Challenges and Strategies

Entrepreneurial Challenge	**Philippines: Founder A**	**Philippines: Founder B**	**Latvia: Founder A**	**Latvia: Founder B**	**Common Themes**
Funding Issues	Relied on personal savings and loans.	Secured funding through local investors.	Faced difficulty with venture capital, self-funded.	Used angel investors for initial capital.	Funding remains a critical challenge.
Market Adaptation	Focused on the local market before expanding internationally.	Niche market strategy with gradual expansion.	Shifted focus from local to European markets.	Adapted product based on market trends in Europe.	Flexibility in market adaptation is essential.
Operational Complexity	Built a solid local team to manage operations.	Operated with a small team and outsourced manufacturing.	Managed initial operations independently, later scaled.	Focused on digital tools for scaling operations.	Team-building or outsourcing is crucial for growth.
Competition	Differentiated through unique product offerings.	Focused on customer loyalty and branding.	Competed by offering sustainable products.	Used aggressive pricing and promotions to gain market share.	Competition drives differentiation and innovation.

Source: Compiled by the authors based on primary and secondary data.

Table 1 highlights the critical challenges faced by the founders, such as funding issues, market adaptation, operational complexity, and competition. Founders in both the Philippines and Latvia encountered difficulties securing funding, with Filipino founders relying on personal savings and local investors. In contrast, Latvian founders faced challenges with venture capital and had to self-fund. Both groups also had to navigate market adaptation, with Filipino founders initially focusing on the local market before expanding, while Latvian founders adapted their products to meet European market demands. Operational complexities were addressed through team building or outsourcing. Competition, a significant challenge in both countries, led the founders to differentiate their products or services. These challenges illustrate start-up founders' common hurdles in their entrepreneurial journeys (Acs, Armington 2006; Brown et al. 2020).

Table 2

Key Insights and Lessons

Insight/Lesson	Philippines: Founder A	Philippines: Founder B	Latvia: Founder A	Latvia: Founder B	Common Themes
Resilience	Overcame financial hardships through perseverance.	Persisted despite initial market rejection.	Demonstrated resilience in adapting to new regulations.	Managed setbacks by staying focused on long-term vision.	Resilience is critical in overcoming adversity.
Networking and Collaboration	Established local partnerships for expansion.	Built a strong network of local suppliers	Used industry connections to expand in Europe.	Collaborated with European firms to scale faster.	Networking is essential for growth and opportunities.
Adaptability	Adapted business model to respond to local needs.	Pivoted business strategy to meet customer demands.	Adapted quickly to market changes in Europe.	Stayed agile and adjusted to shifts in consumer behavior.	Adaptability is critical for navigating market changes.
Resource Management	Focused on maximizing limited resources.	Outsourced to manage cost constraints.	Optimized use of available resources in scaling.	Leveraged external resources to improve efficiency.	Efficient resource management is necessary for success.

Source: Compiled by the authors based on primary and secondary data.

Table 2 illustrates how the founders navigated the business landscape and the many challenges and opportunities. Key strategies include resilience, networking and collaboration, adaptability, and resource management. Filipino founders focused on building strong local networks and partnerships for expansion, while Latvian founders relied on industry connections to expand into broader European markets. Adaptability was vital, with founders adjusting their business models or product offerings in response to market shifts (Audretsch et al., 2006; Autio et al., 2014). Efficient resource management, whether by outsourcing or leveraging external resources, enabled founders to scale their operations despite limited resources. Founders from both countries highlighted how resilience helped them overcome early setbacks. They also stressed the importance of networking and forming solid partnerships to access resources and expand their businesses. Adaptability was cited as crucial for staying competitive in dynamic markets, and effective resource management, whether through outsourcing or efficient use of available resources, was essential for long-term growth. These lessons offer practical advice for other entrepreneurs facing similar challenges in start-up environments (Audretsch et al. 2019; Giones et al., 2020).

Table 3

Comparison of Founders' Approaches

Factor	**Philippines: Founder A**	**Philippines: Founder B**	**Latvia: Founder A**	**Latvia: Founder B**	**Common Themes**
Industry	Technology	Retail	Manufacturing	Tech/Services	Different industries impact their challenges and strategies.
Funding Source	Personal savings, loans	Local investors	Self-funded venture capital	Angel investors	Funding paths affect business growth.
Market Approach	Local first, then global	Niche, then broader market	Local to European market	European market focus	The market approach varies depending on location and industry.
Scale of Operations	Local to Global	Regional	Regional to European	National to European	Scale influences operational strategies and competition.

Source: Compiled by the authors based on primary and secondary data.

Table 3 provides a comparative view of the entrepreneurial approaches across the cases. Resilience, adaptability, and the value of networking are examples of common entrepreneurial attributes that explain the commonalities. However, the entrepreneurs' different markets, finance sources, and industries lead to disparities. In contrast to Latvian founders, who initially concentrated on the European market, Filipino innovators prioritized local markets before branching out globally. The funding paths also differed, with Filipino founders often self-funding or relying on local investors, while Latvian founders had more access to angel investors and venture capital. These similarities and differences highlight how geographic location, industry sector, and resource access influence the entrepreneurial journey (Colombo et al. 2006; Sarasvathy 2008).

Conclusion and Recommendations

The study highlighted the Latvian and Philippine entrepreneurs' diverse challenges and adaptive strategies for navigating the complexities of startup ecosystems. Facing the challenge of ecosystem lifecycle, both regions had to uplift their main operational goals and obstacles on establishing sustainable standards, securing their initial resources, meeting the rapid changing of market demands, and maintaining resilience and adaptability to the everyday business world challenge and competition. These two regions navigate thrive and complexities despite facing obstacles by leveraging innovative strategies, fostering strong network connections, and managing the pressures of business demands. Comparative analysis showed that practicing resourcefulness and planned strategies is a

critical factor in success in business. Also, entrepreneurs must be resilient to overcome obstacles, use networks to gain access to opportunities and resources, and continue to be flexible in response to shifts in the market. On the one hand, streamlining operations and cutting expenses can be achieved through effective resource management techniques, including outsourcing and technology adoption. The development of start-up ecosystems through incubators, accelerators, and mentorship programs, as well as the provision of inexpensive financing programs, are ways that policymakers and players in the business ecosystem can improve funding accessibility. Cross-border cooperation can also increase start-ups' market potential and facilitate information sharing. Akin to every journey, the startup road is characterized by inevitable challenges and exciting opportunities, only to be overcome by passion and commitment to adapt and innovate.

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Jaunuzņēmumu attīstība Latvijā un Filipīnās: uzņēmējdarbības piemēru izpēte

Kopsavilkums

Jaunuzņēmumi ir nesen izveidotie uzņēmumi, kurus izveidoja uzņēmēji ar mērķi radīt un attīstīt jaunu piedāvājumus tirgum un veicināt ekonomikas izaugsmi. Tas koncentrējas uz nozaru īpatnībām, izmantojot inovatīvus rīkus, stratēģijas un biznesa modeļus. Tomēr veikto pētījumu skaits, kas pēta jaunuzņēmumu dibinātāju grūtības un viedokļus, jo ne visi ir apmācīti un spējīgi kļūt par uzņēmējiem, ir ierobežots. Tāpēc autori veica šo pētījumu. Šis pētījums balstās uz kvalitatīvām metodēm, pēta vairākus gadījumus, koncentrē uzmanību uz atlasīto jaunuzņēmumu no Filipīnām un Latvijas stāstu analīzi un prezentēšanu. Pētījuma mērķis ir apgūt un izprast uzņēmēju grūtības, līdzības un atšķirības, atrast biznesa idejas un labāko praksi, ko var ieteikt un praktizēt abās valstīs, tādējādi palīdzot esošajiem un topošajiem jaunuzņēmumiem gūt panākumus uzņēmējdarbībā. Pētījumā atklājās, ka tēmas, kas raksturo dibinātāju piedzīvotos izaicinājumus, ir šādas: finansējums joprojām paliek kritisks izaicinājums, elastība tirgus adaptācijā ir būtiska, komandas veidošana vai ārpakalpojumu izmantošana ir izšķiroša izaugsmei, un konkurence veicina diferenciāciju un inovācijas. Tēmas, kas izcēlās saistībā ar dibinātāju galvenajām atziņām un mācībām: noturība ir izšķiroša, lai pārvarētu grūtības, tīklošanās ir būtiska izaugsmei un iespējām, pielāgošanās spēja ir izšķiroša, lai orientētos tirgus izmaiņās, un efektīva resursu pārvaldība ir nepieciešama panākumiem. Visbeidzot, tika konstatēts, ka abu valstu jaunuzņēmumiem ir kopīgas problēmas, stratēģijas un pārdomas attiecībā uz uzņēmējdarbības veikšanu. Abu valstu aptaujātie uzņēmumi savu kapitālu ieguva no personīgajiem uzkrājumiem un aizdevumiem. Vispirms tie koncentrējās uz vietējo tirgu, tad izveidoja savu nišu un paplašināja savu darbību reģionālā vai globālā mērogā. Tika atzīmēts, ka Latvijas dibinātāji orientējas uz reģionālo tirgu, savukārt Filipīnu dibinātāji paredz iekļūt globālajā tirgū.

Atslēgas vārdi: uzņēmējdarbība, jaunuzņēmumi, uzņēmējspējas, izpētes gadījumi, Filipīnas, Latvija.

Dace Štefenberga, Indra Kristiāna Balode (Latvia)

COLLABORATIVE MODELS FOR HUMAN CAPITAL DEVELOPMENT IN THE REGION

The Latvian National Development Plan 2021-2027 outlines the need for sustainable regional development. This article describes theoretical aspects and feasibility studies of cooperation models for regional economic development in the context of human capital development and the brain drain challenge that stifles it. Regional universities and their inclusion into European University alliances are defined as the driving force for further development in higher education and innovation in the regions. One of the most important tasks is to bring together the expertise and strengths of the involved partners to highlight the best potential outcomes in different combinations of individuals and institutions and then validate these models for the development of higher education and innovation in the region. Key questions usually are what, why, and how. Why it is necessary, how we should interact and cooperate with partners (international partners, national institutions, entrepreneurs, local communities, NGOs, local government), and what we can do to achieve overall goals, defined in Latvia's National Development Plan and Latvia 2030 strategy. Returning and retaining human capital in the region brings significant added value to its growth. The region's external attractiveness is key to its development, including business, the local community, and opportunities for cooperation for business development.

Keywords: regional attractiveness, human capital development, collaboration.

1. Introduction

Today, the world is living in an era of change. An era that, as early as the end of last century, economists Warren Bennis and Burt Nanus called the VUCA world (Bennis, Nanus 2007). The concept includes four elements: volatility, uncertainty, complexity and ambiguity. It is an era that requires a special capacity to adapt to changes before they are even upon us. Industrial revolutions have always been carried out by scientists and inventors, and they have always started with innovation. Changes and development in each level from local to global therefore have one essential element: human resources. The polycentric development of regions has become a more significant concept for development at the national level.

We are experiencing significant and rapid changes in the economic environment – industrial revolutions, including the presence of artificial intelligence, geopolitical aspects, and even changes in the thinking of society.

The relevance of this scientific article is related to the importance of cooperation and the sustainability of human resources in the physical place – the region, cities, small towns and rural areas. Global and national level development depends on performance at a regional and local level. Innovation plays a significant role in economic development (start-ups; cluster creation, networking; collaboration between different actors at regional and global levels). Regions are facing several challenges related to human resources: depopulation and "brain drain" which can slow down development unless proactive measures are taken.

The objective of the article is to identify best practices for cooperation to enable communities to participate in regional and global development processes and reduce the "brain drain" in the regions.

Methods used: monographic method (literature studies); analysis of statistical data, surveys, case study analysis.

2. Theoretical findings of regional development perspective

In recent decades, national planning documents in Europe and Latvia, as well as scientists and practitioners, have examined different approaches and factors for regional development. The authors stress the role of the business environment for innovation development in regions and the importance of human capital for entrepreneurship. In line with the Regional Development Planning Guidelines (VARAM 2020), regional policy will contribute to economic development in the 2021-2027 years and reduce regional disparities, the priority is balanced development of the whole area. It is important to identify the level and pace of regional development. Polycentric development is the only significant concept of spatial development ensuring the satisfaction of requirements of all stakeholders (Bevilaqua et al. 2017). As the development of new businesses and ideas is linked to the integration of innovation and creativity into everyday activities, the creation of knowledge-intensive enterprises and the role of knowledge in entrepreneurship increase the competitiveness of enterprises. One of the most important prerequisites to regional development in the previous planning periods has been the reduction of regional differences in territorial development. Regional development is a broad term linked to a region's economic activities, diminishing regional differences, and focusing on the public good. The concept of a region is described in detail by the United Nations Industrial Development Organisation, and it predominantly is *a geographic and social economic concept* (UNIDO 2019). New trends define the region more as an economic concept stressing meaning of "learning regions" (Fritsch, Schroeter 2011; Hajek, Henriques 2017; Martins, Ling 2017; OECD 2013; Anderson, Karlson 2004; Doloreux 2003; Pekkarinen, Harmakorpi 2006; Partanen 2017; Pīlēns 2019), less as a geographical concept as has been before. The index of regional innovations and development defines the most important drivers of regional entrepreneurship, which includes cluster formation, networking, social capital, availability of education, innovation capacity, labor market regulation, and others (REDI 2013).

The impact of the knowledge base, the development, distribution and application of new knowledge, commercialization opportunities, and the nature of innovations are important factors to fuel economic change (McKelvey et al. 2020; Yoon, Kim, Buisson, Philips 2018; Acs et al. 2018). The need to consistently move away from the traditional economic model to research and development, use of specific technologies, specific knowledge and work organization experience has been stressed also by Otto Šarmers (Šarmers 2018), because only when a company has a certain knowledge level and experience, it can transform from a start-up and increase the range and scope of products (Nuscheler et al. 2019). Important factors of regional development are universities in the region, where intellectual potential required for innovations is concentrated. Cooperation will play one of the most important roles in the following governance process (Šarmers 2018). One of the most pressing challenges is ensuring that academic programs remain responsive to the evolving demands of local industries. Entrepreneurs frequently cite a mismatch between the skills acquired by graduates and the needs of businesses, particularly in the technology and engineering sectors. Universities must cultivate closer ties with industry through internships, apprenticeships, and collaborative research projects that give students hands-on experience with the practical skills demanded by employers. The regional dimension in this cooperation has particular importance because, by focusing investments at a local level, it is possible to achieve a high-quality living space and improve the creativity of human resources and the innovation potential (Štefenberga 2022).

This exodus of talent further complicates efforts to bolster the local economy and highlights the need for greater collaboration between higher education institutions and local employers. Creating meaningful career opportunities within the region could mitigate this outflow of talent, ensuring that graduates not only stay but also contribute to the regional economy.

Theoretical sources cite several regional development factors. These are summarized in Table 1.

Table 1

Regional development factors: Summary from studies

Factors	**Authors**
Innovation Capacity of the Region	Pekkarinen, Harmakorpi 2006
Adaptation to changes, Openness to knowledge, partnership and cooperation	Abou Hana 2018
Cooperation in knowledge creation use and implementation in local individual and institutional level; Tripple Helix, Quadruple Helix, Penta Helix; «civic university»	Parto, Doloreux 2004; Etzkowitz 2008; Leydesdorff 2011; Goddard, Kempton 2016
Geographical proximity	Asheim, Isaksen 1997; Cooke 2001; Koben Bakker 2019
Specific characterization of the region, qualified workforce	Lall, Yilmaz 2001
Start-ups, new ventures and SME, transformation of new ideas and products in new markets with support of traditional enterprises	Julien Lachance 2001; Michael, Piraro 2007; Chapple et al. 2011
Exploiting the region's unique natural resources, combined with innovative technologies	Bialy, Žarnovsky 2017
HEI and scientific institutions in region, possibility to create clusters and support institutions for entrepreneurship development, legislation policy for investment, infrastructure; good environment for entrepreneurship; cooperation between state, business and nongovernmental organization, high quality of life, appropriate business infrastructure	Matveikin et al. 2007; Lee et al. 2000 ; Andersson, Karlsson 2004; Arnkil 2010; Ostrom 2010; Calzada, Cowie 2017;

Source: created by the authors.

3. Theoretical and practical findings on human capital development challenges in regions

Human capital development is a driving component of regional economic growth, innovation, and social progress. However, various challenges pose significant obstacles to maximizing the potential of human capital. Author Marjan Entekhabi highlights these challenges in his publication – low literacy and education levels, insufficient healthcare, high unemployment and underemployment, brain drain, gender disparities, and limited investment in skills development (Entekhabi 2023). Of these challenges, the most pressing in the Ventspils University of Applied Sciences region is the brain drain factor, which affects the human capital and thus the development of the region.

The brain drain factor is challenging to study nowadays, as there is no certain way to argue about good or bad impact, and how wide the regional boundaries are, not geographically but in terms of impact. In the study "Recognizing New Trends in Brain Drain Studies in the Framework of Global Sustainability" (Vega-Muñoz et al. 2021, p. 19) authors emphasize that "scholars need to be aware that beyond the change of direction in

the national effects, they need to extend their analysis to other countries when countries consider themselves destination countries." This statement was also confirmed in the Erasmus+ joint project "Enhancing development of entrepreneurial strategies at university locations affected by brain drain" (ENDORSE n/d). Common recommendations from the project's findings and this publication include the following statements:

- Collaboration of students from different fields to make interdisciplinary research and projects;
- Match graduates' skills with labor market requirements;
- Promotion of cooperation skills;
- Graduate's engagement in local community building and regional development activities.

Despite the challenges posed by brain drain and other challenges, regions can thrive by embracing innovative educational strategies, fostering entrepreneurial ecosystems, and strengthening collaboration through Quadruple Helix and other models.

4. Collaboration impact from local to global levels

One step to help the region grow with an impact on human capital is the inclusion of Ventspils University of Applied Sciences in the European University Alliance COLOURS "Collaborative innovative Sustainable Regional universities" which unites 9 regional universities from Germany, Poland, Croatia, Sweden, North Macedonia, France, Spain and Italy, 126 000 students, 12 300 staff members, around 100 regional stakeholders, 55 associated partners and provides impact on more than 21 mln inhabitants of whole Europe (COLOURS European University Alliance n/d b). The focus is that it is an alliance of regional universities, and it is crucial for regional economic development. The main goal of the alliance is to promote joint education programmes in research and innovation with international teams, in partnership with local companies, also sharing knowledge and experience.

The development of new scientific and technological knowledge must be encouraged in collaboration (McKelvey et al. 2020). As the economic structure of the world is rapidly changing in light of the economic crisis caused by the global pandemic and changes in the geopolitical environment, we must be able to adapt to the situation that is yet to follow (Štefenberga 2022).

Today, several cooperation models have been developed and further supplemented to define the cooperation of participants of an innovation system:

1. The Triple Helix model (Etzkowitz 2008; Leydesdorff 2011) is based on the cooperation of universities, the industry, and governance authorities. Most often used depending on the sector in which this co-operation is being implemented;
2. Four core elements of the middle process model or Quadruple Helix (Andersson, Karlsson 2004; Arnkil 2010), which form the regional innovation system: companies (assuming responsibility for knowledge creation and distribution, and application by commercialization); institutions (decision making institutions, industrial research and development institutions, governments, universities and other public institutions which affect technology creation, development, transfer and use); knowledge infrastructure (physical and organizational infrastructure to innovation support); policy-focused regional innovation (innovation policy aimed at a general system that fosters the ability to learn and knowledge distribution). (Goddard, Kempton 2016).

The Quadruple Helix model was also found to be the best solution for stakeholder involvement in regional development processes within the COLOURS alliance. Each

alliance partner organizes several "CoLabs", where all Quadruple Helix actors are represented, defining a topic of regional relevance within the framework of the 4 overarching themes of the Alliance: green transition, digital transformation, human well-being, and food production. The next step within CoLab is to choose a challenge and identify ideas, opportunities, scenarios, and/or business models, then continue work in the next steps, finding possible solutions and implementing best practices. An important part of this cooperation is to boost students' innovativeness through participation in CoLabs, hackathons and engagement in a community of new entrepreneurs. Figure 2 shows the CoLab description and possible "Quadruple Helix" long-term cooperation within CoLab creation.

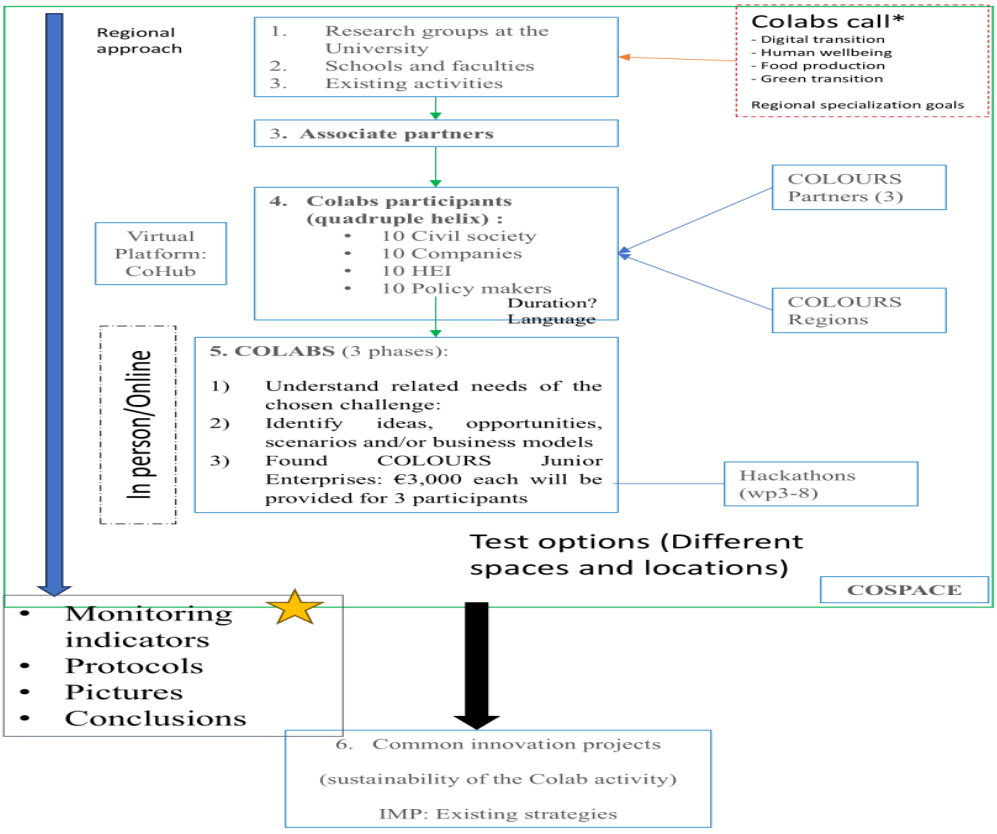

Figure 2. **CoLab description**

Source: COLOURS European University Alliance n/d a.

The modelling of regional development processes and determination of the performance under given circumstances in a dynamic environment is not a simple task, the diminishing of negative trends is possible, by using the uniqueness of each place, the available natural resources, and the availability of human capital ensuring innovative solutions in entrepreneurship, development of high added value products. In this area, knowledge centers found in the regions are of importance — higher education establishments, technology parks, increasingly developing "co-working premises and offices", networking events, and clusters ensuring unprecedented opportunities for common regional development.

Conclusions and discussion

- The region is an excellent platform for start-ups and business ideas because of the environment and good conditions for personality development nevertheless, depopulation and "brain drain" are crucial factors for development slowdown.
- Reconfiguration of the role of education. Institutions of higher education and science boost economic development in regions.
- Ecosystems of innovation and economic development are related to human resources. Innovative enterprises are developed more in regional cities; infrastructure and environment are important.
- Cooperation is crucial. Quadruple Helix is now an appropriate model for cooperation in innovation creation in the region because it promotes and supports individual-level incentives for creative thinking development; CoLabs is a platform to meet stakeholders and find solutions for common challenges.

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Sadarbības modeļi cilvēkkapitāla attīstībai reģionā

Kopsavilkums

Latvijas Nacionālajā attīstības plānā 2021.-2027. gadam ir uzsvērta ilgtspējīgas reģionālās attīstības nepieciešamība. Šajā rakstā aprakstīti reģionālās ekonomiskās attīstības sadarbības modeļu teorētiskie aspekti un priekšizpēte saistībā ar cilvēkkapitāla attīstību un to negatīvi ietekmējošo intelektuālā darbaspēka aizplūšanas problēmu. Reģionālās universitātes un to iekļaušanās Eiropas universitāšu aliansēs tiek definētas kā virzītājspēks turpmākai augstākās izglītības un inovāciju attīstībai reģionos. Viens no svarīgākajiem uzdevumiem ir apvienot iesaistīto partneru zināšanas un stiprās puses, lai izceltu labākos iespējamos rezultātus dažādās personu un institūciju kombinācijās un pēc tam apstiprinātu un īstenotu šos modeļus augstākās izglītības, ekonomikas un inovāciju attīstībai reģionā. Galvenie jautājumi parasti ir: kas, kāpēc un kā. Kāpēc tas ir nepieciešams, kā mums būtu jāsadarbojas savstarpēji ar partneriem (starptautiskajiem partneriem, valsts institūcijām, uzņēmējiem, vietējām kopienām, NVO, pašvaldībām) un ko mēs varam darīt, lai sasniegtu mērķus, kas definēti Latvijas Nacionālajā attīstības plānā un Latvijas ilgtspējīgas attīstības stratēģijā 2030. Cilvēkkapitāla atgriešanās un noturēšana reģionā rada būtisku pievienoto vērtību tā izaugsmei. Reģiona attīstībai būtiska ir tā ārējā pievilcība, tostarp uzņēmējdarbībai, sabiedrībai un sadarbības iespējām starp visām iesaistītajām pusēm.

Atslēgas vārdi: reģiona pievilcība, cilvēkkapitāla attīstība, sadarbība.

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Rakstiem krājumos:

Turner R. H. (1990) "A Comparative Content Analysis of Biographies." In: Øyen, E., ed. *Comparative Methodoloy: Theory and Practice in International Social Research*. London, etc.: Sage Publications. pp. 134–150.

Rakstiem žurnālos:

Bela B. (1997) Identitātes daudzbalsība Zviedrijas latviešu dzīvesstāstos. *Latvijas Zinātņu Akadēmijas Vēstis, A, 51,* Nr. *5/6,* 112.-129. Lpp. (In Latvian)

Rakstiem laikrakstos:

Strazdins I. (1999) Matemātiķi pasaulē un Latvijā. *Zinātnes Vēstnesis,* 8. marts. (In Latvian)

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