

YEREVAN STATE UNIVERSITY

**BULLETIN OF YEREVAN UNIVERSITY:
ECONOMICS**

VOLUME 17 - ISSUE 1(47)

June - 2026

«Three issues of “Bulletin of Yerevan University: Economics” are published annually. The journal has been published since 2010. It is the successor of “Journal of Yerevan University” published in 1967-2009

Editorial Board:

Editor-in-chief:

Karlen Khachatryan, Ph.D., Associate Professor of Economics and Dean, Faculty of Economics and Management, Yerevan State University, Armenia - karlen.khachatryan@ysu.am

Aleksandr Gevorkyan, Full Professor of Economics, Henry George Chair in Economics, The Peter J. Tobin College of Business, St. John's University, USA - gevorkya@stjohns.edu

Aram Arakelyan, Full Professor of Economics, Faculty of Economics and Management, Yerevan State University, Armenia - aram.arakelyan@ysu.am

Berch Berberoglu, Ph.D., Foundation Professor of Sociology, Director, Ozmen Institute for Global Studies, University of Nevada, Reno, USA - berchb@unr.edu

Hayk Sargsyan, Full Professor of Economics, Faculty of Economics and Management, Yerevan State University, Armenia – sargsyan.ysu@gmail.com

Ruben Gevorgyan, Full Professor of Economics, Faculty of Economics and Management, Yerevan State University, Armenia - rubengevorgyan@ysu.am

Sergey Kalenjyan, Full Professor of Economics and Dean, High School of Corporate Governance of the Russian Academy of National Economy and Public Administration under the President of the Russian Federation, Russia - sk@ranepa.ru

Vahagn Jerbashian, Ph.D., Associate Professor, Department of Economic Theory, University of Barcelona, Spain - vahagn.jerbashian@ub.edu

Viktor Sidorov, Full Professor, Head of the Chair of Economic Theory, Kuban State University, Russia - sidksu@mail.ru

Vladimir Asriyan, Ph.D., CREI Senior Researcher, UPF Adjunct Professor and Barcelona School of Economics Affiliated Professor, Spain - vasriyan@crei.cat

Yakov Yadgarov, Full Professor of Financial Academy under the Government of the Russian Federation, Russia - yakovyadgarov@mail.ru

CONTENTS

Economic Theory

<i>Grigor Hayrapetyan, Nonna Khachatryan, Narine Mirzoyan</i> HIGH-SKILLED EMIGRATION FROM ARMENIA.....	5
--	---

Management

<i>Amalya Saribekyan, Anna Hakobjanyan, Vardush Gyoalyan</i> FACTOR-BASED PRIORITIES OF NATIONAL POTENTIAL IN THE REPUBLIC OF ARMENIA: THE CASE OF YEREVAN STATE UNIVERSITY.....	16
---	----

<i>Amalya Galstyan, Elena Kulchitskaya, Elena Kadura</i> ANALYSIS OF THE LABOR MARKET OF ARMENIA IN THE CONTEXT OF CONTEMPORARY CHALLENGES: SOCIO-ECONOMIC AND PSYCHOLOGICAL ASPECTS.....	29
--	----

Finance

<i>Gevorg Kirakosyan, Mikayel Barseghyan</i> THEORETICAL AND APPLIED PROBLEMS OF TAX BURDEN DISTRIBUTION IN THE CONTEXT OF CONSUMPTION, CAPITAL, AND LABOR TAXATION.....	46
---	----

<i>Ani Grigoryan</i> STRATEGIC DEBT BURDEN ASSESSMENT AND FINANCIAL SUSTAINABILITY ANALYSIS OF DIAGEO.....	55
--	----

<i>Areg Baghdasaryan</i> ACCOUNTS OPENING ISSUES IN THE CONTEXT OF THE TRANSFORMATION OF THE BANKING SYSTEM	69
---	----

Economic and Mathematical Modeling

Rafik Mashuryan

IDENTIFICATION AND HARMONIZATION OF MATERIAL VALUES
AND PRODUCT NAMES IN A GROUP OF COMPANIES USING NLP
METHODS..... **83**

International Economics

Mariam Voskanyan, Anna Grigoryan

EVALUATION OF U.S. TARIFF POLICY AND ITS IMPACT ON
IMPORTS IN THE CONTEXT OF GLOBALIZATION..... **92**

HIGH-SKILLED EMIGRATION FROM ARMENIA

GRIGOR HAYRAPETYAN* , NONNA KHACHATRYAN** ,
NARINE MIRZOYAN*** 
Yerevan State University

Abstract: This paper examines the phenomenon of high-skilled emigration, or brain drain, with a specific focus on Armenia. Despite a global Armenian diaspora exceeding seven million, the Republic of Armenia faces increasing challenges associated with the outflow of educated professionals. Using statistical data from the Central Bank of Armenia, the World Bank, and the World Population Review, the study analyzes the dynamics of remittances, foreign direct investment inflows, and brain drain indices in relation to economic indicators such as average salaries and unemployment rates from 2013 to 2024. The findings reveal that Armenia's brain drain is not solely driven by economic factors like wages or unemployment but is also shaped by geopolitical shocks, policy frameworks, and strong diaspora linkages. While migration has generated benefits through remittances, diaspora networks, and educational incentives, the persistent rise of the Brain Drain Index highlights long-term risks to Armenia's socio-economic development. The paper concludes that without targeted policies and improved migration data management, Armenia's growing reliance on external inflows cannot offset the structural challenges posed by high-skilled emigration.

Key words: *brain drain, high-skilled migration, remittances, migration policy, diaspora networks, migration policy, human capital*

Introduction

The emigration of highly skilled workers has remained a central issue in migration and development research for more than five decades. While earlier theoretical contributions emphasized the potentially severe welfare losses for sending countries, more recent empirical studies suggest that the net effects of high-skilled migration depend on institutional capacity, economic structure, and the ability of origin countries to leverage diaspora linkages. In the case of Armenia, however, structural vulnerabilities associated with its small size, limited labor market depth, and geopolitical exposure

* **Grigor Hayrapetyan** – PhD in Economics, Associate Professor at the YSU Chair of Economics and International Economic Relations

Email: grigor.hayrapetyan@ysu.am ORCID: <https://orcid.org/0009-0008-1088-4504>

** **Nonna Khachatryan** – PhD in Economics, Associate Professor at the YSU Chair of Management and Business

E-mail: nonnakhachatryan@ysu.am ORCID: <https://orcid.org/0009-0000-3916-6735>

*** **Narine Mirzoyan** – PhD in Economics, Associate Professor at the YSU Chair of Management and Business

E-mail: narinemirzoyan@ysu.am ORCID: <https://orcid.org/0009-0007-6334-2920>



This work is licensed under a Creative Commons Attribution-NonCommercial-4.0 International License.

Received: 30.10.2025

Revised: 17.01.2026

Accepted: 19.06.2026

© The Author(s) 2026

increase the long-term risks associated with sustained high-skilled emigration. Armenia has historically been a country of emigration, resulting in a global Armenian population of about 10 million, of which only 3 million reside in the Republic of Armenia. Over time, large and influential Armenian communities have formed in Russia, the United States, France, Lebanon, Ukraine, and many other countries (Айрапетян, 2016). These diaspora centers play a crucial role in shaping Armenia's foreign economic relations, serving as important bridges for trade, investment, and cooperation. In addition, remittances sent from abroad constitute a significant source of financial inflow, which not only supports households but also contributes to the overall stability and development of Armenia's economy. In general, there is limited statistical data on the diaspora involvement in Armenia. Developing a diaspora engagement program requires a clear understanding of what diaspora represents. The IOM (2019, p. 49) defines diaspora as “migrants or descendants of migrants whose identity and sense of belonging, either real or symbolic, have been shaped by their migration experience and background. They maintain links with their homelands and to each other based on a shared sense of history, identity, or mutual experiences in the destination country (Айрапетян, 2016).

Migration has been a constant feature throughout human history, describing the movement of people from one location to another, either temporarily or permanently, often motivated by social, economic, or personal factors (Contini P., Carrera L., 2022). When large numbers of educated individuals leave a country within a relatively short time, the phenomenon known as brain drain can occur. This challenge is most common in least-developed and developing countries, which, due to lower living standards, struggle to retain or attract highly skilled professionals compared to developed nations. So, the term “**brain drain**” refers to the large-scale migration of highly educated and skilled individuals from one country to another. While it most often describes the flow of human capital from developing to developed nations, it can also occur horizontally, involving the movement of professionals such as engineers, physicians, and scientists between developed countries. The primary drivers of brain drain include significant differences in working conditions, salaries, and career advancement opportunities between origin and destination countries; poverty and limited economic growth in the source country; discrimination, political repression, and restrictions on personal freedoms; environmental crises and the growing impact of climate change; ongoing military or civil conflicts.

The aim of this paper is to investigate the scale, drivers, and consequences of high-skilled emigration from Armenia, with a particular focus on its economic and social implications. By analyzing statistical data on remittances, foreign direct investment, salaries, unemployment, and brain drain indices, the study seeks to identify the underlying factors influencing skilled labor mobility and assess the long-term risks and opportunities for Armenia's development.

Research methods. This study employs a quantitative descriptive and comparative research design aimed at examining the dynamics, potential drivers, and economic implications of high-skilled emigration from Armenia. The analysis is based on secondary data obtained from internationally recognized and official sources, including the Central Bank of Armenia, the World Bank's World Development Indicators, and the World Population Review database. The empirical investigation covers the period 2013–2024. The primary indicator used to assess high-skilled emigration is the Brain Drain

Index. To explore potential determinants and consequences of brain drain, the index is examined in relation to selected macroeconomic variables, including average annual wages, unemployment rates, remittance inflows, foreign direct investment (FDI) net inflows, share of research and development expenditures in GDP and researchers in research and development (per million people). The methodological approach consists of trend analysis, cross-variable comparison, and descriptive correlation assessment. Graphical analysis is used to identify patterns, co-movements, and structural shifts across time. Particular attention is paid to periods characterized by geopolitical and economic shocks in order to assess the sensitivity of migration dynamics to external factors.

The study does not attempt to establish strict causal relationships through econometric modeling; rather, it aims to evaluate whether commonly cited labor-market indicators sufficiently explain fluctuations in Armenia's Brain Drain Index and to assess the broader structural context within which high-skilled migration occurs. One limitation of the research is the reliance on available aggregate-level data, as Armenia lacks a comprehensive and integrated migration statistics system, particularly with respect to high-skilled emigration and return migration flows. This constraint limits the possibility of conducting micro-level or sector-specific analyses. Despite these limitations, the methodology allows for a systematic examination of migration trends and their macroeconomic context, providing an analytical foundation for identifying structural patterns and policy-relevant implications.

Main part

The welfare implications of factor flow between countries, unlike those of flows of goods, have received very little theoretical treatment to date. It is widely accepted that emigration of highly skilled people constitutes a loss to a country and fairly generally agreed that emigration of unskilled labor can improve the lot of the remaining population (Berry A., Soligo R. 1969). Berry and Soligo (1969) also argue that while emigration deprives sending countries of skilled labor, these losses can be partly offset through migrants' remittances and the transfer of knowledge back to the home country. Bhagwati and Hamada (1974) emphasize the social externalities associated with highly skilled workers at a time when human capital was becoming increasingly central in development economics (Bhagwati J., Koichi H., 1974). Concerns over brain drain also extended to its public finance implications: while developing countries bear the costs of educating emigrants, the economic returns on these investments are largely captured by high-income destination countries. In addition, migrant-sending countries face substantial tax revenue losses due to the departure of individuals with higher earning potential. A further concern was that large-scale emigration of skilled workers could exacerbate existing inequalities between the rich and the poor. There also exists literature that discusses how high-skilled migration might generate welfare gains for the sending countries. This is the opposite of the "brain drain" effect and is called "brain gain". Stark, Helmenstein, and Prskawetz (1997) illustrate "brain gain" through cross-country wage differentials and information asymmetries between migrants and host-country employers. Wage gaps encourage individuals to invest in additional education with the intention of migrating (Oded S. et al., 1998). In other words, individuals choose to invest in human capital since the anticipated higher earnings abroad outweigh the costs of education. Consequently, the country's overall stock of human capital becomes greater than it would have been in

the absence of migration opportunities (Oded S., Yong W., 2002). For example, in case of Moldova following independence in the early 1990s, there was a substantial wave of emigration from Moldova, a process that ebbed over the following decade. However, emigration has again increased since the early 2000s, partly driven by closer integration with the EU and in line with patterns seen in other Central and Eastern Europe (CEE) and certain former Soviet Union (FSU) economies. The drivers of Moldovan emigration have ranged from political uncertainty and humanitarian issues to limited economic opportunities and social security. While the emigration of working-age Moldovans creates economic and demographic challenges, it also creates substantial potential. The country's large diaspora could be harnessed to provide the skills, new ideas, capital and networks necessary to experiment with new ideas and create value, underpinning sustainable growth in the decades ahead¹.

In recent decades, migratory waves have significantly reshaped the global economic landscape, with countries increasingly competing to attract highly skilled human capital. While evidence shows that developing nations are most negatively affected by brain drain, its overall impact can be viewed in both positive and negative terms—depending on whether it is assessed from the standpoint of the source country, the destination country, or the migrants themselves (Tiankuo Li, 2025). Positive effects of brain drain can encourage greater investment in education within source countries, as individuals may view advanced qualifications as a pathway to future migration; it can generate positive economic effects for source countries by boosting remittance inflows, lowering international transaction costs, and fostering trade links; brain drain can strengthen diaspora networks, promoting the exchange of knowledge, innovation, and technology between origin and destination countries; it may also support circular migration, enabling both sending and receiving countries to benefit from the mobility of skilled labor. Negative effects outside the departure of skilled and innovative individuals diminish the socio-economic potential of source countries; a reduction in tax revenues limits the capacity of source countries to finance public spending; large-scale emigration can create labor shortages in critical sectors such as education and healthcare; in destination countries, migrants may encounter bureaucratic hurdles that prevent them from working in their field of expertise.

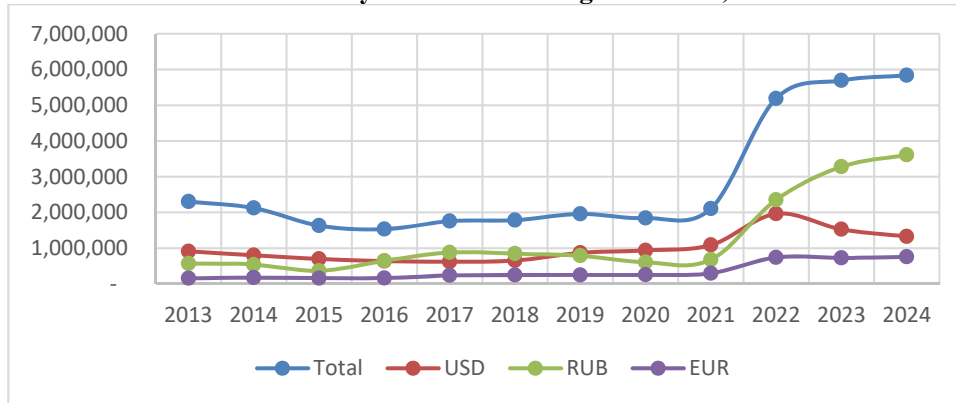
Taking into account the above, we can state that migration and human mobility remain a central trend of the twenty-first century and one of the most topical and complex issues of our time. International labor migration is a transnational phenomenon and cannot, therefore, be effectively managed or addressed only at the national level. It needs to also be addressed at the bilateral, regional and international level². There are significant gaps in migration data management in Armenia. Migration statistics are not comprehensive and at times lack accuracy. Data collection on exits and returns is incomplete. Data gaps hinder the development of evidence-based, effective and inclusive migration policies. Compliance reporting on migration statistics is not in place. There are essential gaps in migration management data capacities, needed for streamlining data collection, analysis and exchange between agencies involved in migration management,

¹ Innovation for Sustainable Development, Review of Moldova, United Nations Economic Commission for Europe, Geneva, 2021.

² International Organization for Migration, Labor Migration in Armenia. Existing Trends and Policy Options, 2012.

based on a common priority set of migration indicators. The administrative information source for migration in Armenia is the State Population Register, which does not fully reflect the data on population movements, given the fact that people mostly do not inform the Police about their movements and hence are left out of the migration statistics³. Besides this, we found that there is not sufficient data or literature about high-skilled (brain drain) emigration from Armenia, especially at a national level. For example, we could not find anything concerning to high-skilled emigration in Armenia's Migration Strategy for 2017-2011 or in Armenia's Mission Strategy (2022-2025), (Chobanyan H., 2019).

Chart 1. Total money transfers of individuals received from abroad through commercial banks of RA by currencies during 2013-2024, thousand dollars



Source: Central Bank of Armenia

Total money transfers of individuals sent to and received from abroad through commercial banks of RA by currencies

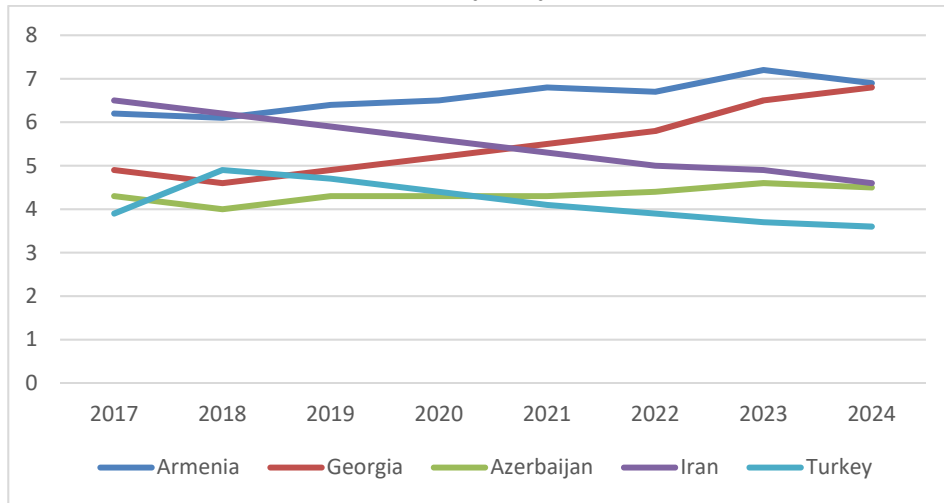
Armenia is a country characterized by dynamic human mobility, with almost every tenth household having a migration connection and a Diaspora of an estimated seven million people. Thus, the Armenian economy is highly dependent on remittances (See Chart 1). Analyzing Chart 1, we can notice that before 2022, total flows were modest and stable. Moreover, during 2013-2015 and 2019-2021, USD flows were dominant. After 2021 a dramatic surge occurred, with RUB and EUR gaining prominence, while USD lost dominance. This shift likely reflects geopolitical and economic events (Russian-Ukrainian war)—most probably linked to sanctions, currency realignments, and changes in regional trade and financial flows.

In Chart 2 Brain Drain Index is presented for Armenia and its neighboring countries. As we can notice between 2017 and 2024, Armenia and Georgia faced escalating brain drain, becoming the two most affected countries by 2024. Azerbaijan remained stable at a moderate level, while Iran and Turkey experienced declining levels, possibly due to structural or external constraints on migration rather than improved domestic conditions. A relatively high brain drain index means that Armenia experienced a rising outflow of skilled professionals. Here, taking into account that Armenia also is a small developing country, a relatively high brain drain index will have a much more negative impact on

³ IOM ARMENIA MISSION STRATEGY (2022-2025), available at https://crisisresponse.iom.int/sites/g/files/tmzbd11481/files/appeal/documents/IOM-Armenia-Country-Strategy_22-25.pdf

Armenia’s economy in the long run perspective. Here also we would like to mention that the return of highly skilled migrants largely depends on the economic and political conditions in their home country. When these conditions are unfavorable, experience shows that return incentives often prove ineffective.

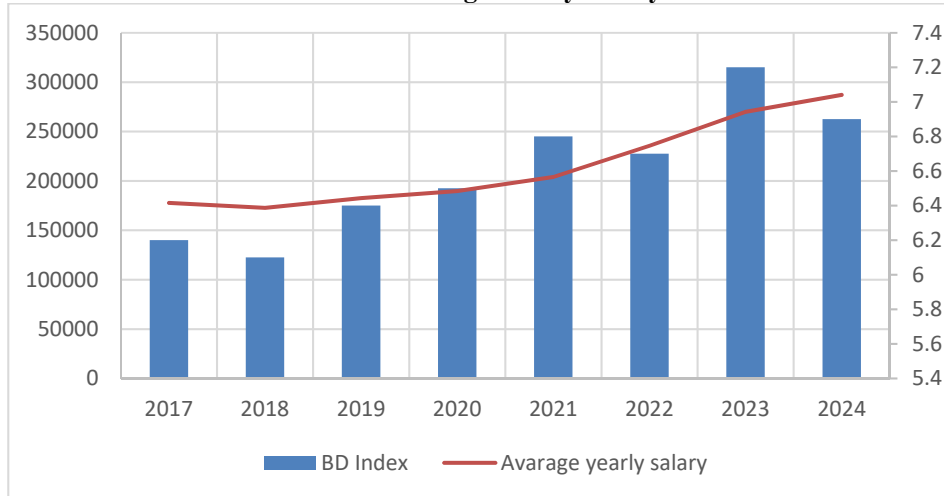
Chart 2. Brain Drain Index in Armenia and its Neighboring Countries in 2017-2024



Source: World Population Review, Brain Drain Countries

In order to find out the reason for the relatively high brain drain index in Armenia, we tried to get the relationship between the brain drain index and the average yearly salary in Armenia (see Chart 3).

Chart 3. Brain Drain Index and Average Yearly Salary in Armenia in 2017-2024

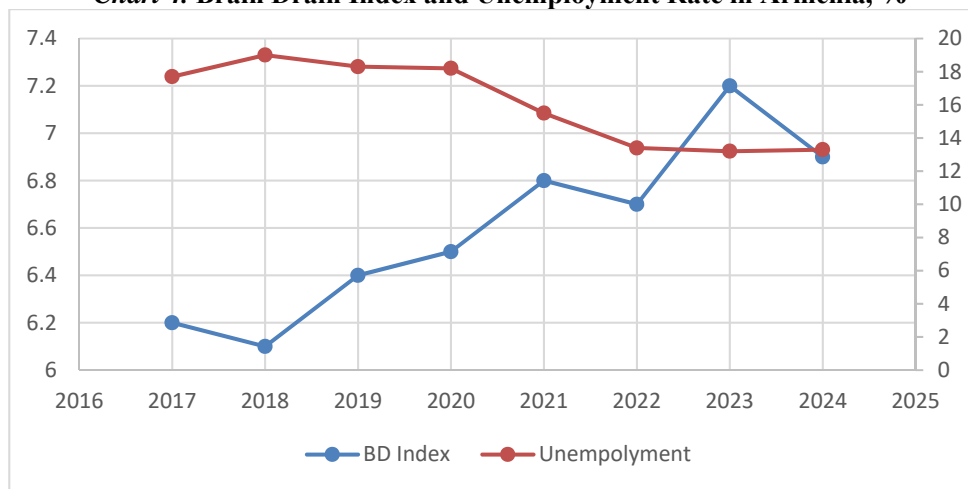


Source: World Population Review, Brain Drain Countries and World Bank Group, World Development Indicators

Analyzing chart 3, we can state that as salaries rise steadily, the Brain Drain Index shows fluctuations. Moreover, the highest Brain Drain Index (2023) coincides with a strong rise in salaries, suggesting that even with increasing salaries, the brain drain index peaked. As the early researches show, 20% of the potential migrant households surveyed were categorized as “bad living conditions”, 47% “average living conditions” and 33% “best living conditions”. Interest in migration varies only slightly across the social condition categories, with those households living in better social conditions having slightly more prospective migrants⁴. So, it is clear that in the case of Armenia, Brain Drain (Brain Drain Index) is not strictly salary-driven and although higher wages may reduce emigration incentives, other push/pull factors strongly affect the index. For example, policy shifts or external shocks (like geopolitical or economic events) as well as a huge Diaspora (reuniting with the family) may explain the sharp changes in the Brain Drain Index between years. The steady salary growth trend indicates improving economic conditions, but it hasn’t been sufficient to consistently counteract brain drain.

Next we tried to get relationships between the Brain Drain Index and Unemployment rate (See Chart 4).

Chart 4. Brain Drain Index and Unemployment Rate in Armenia, %



Source: World Population Review, Brain Drain Countries and World Bank Group, World Development Indicators 2025

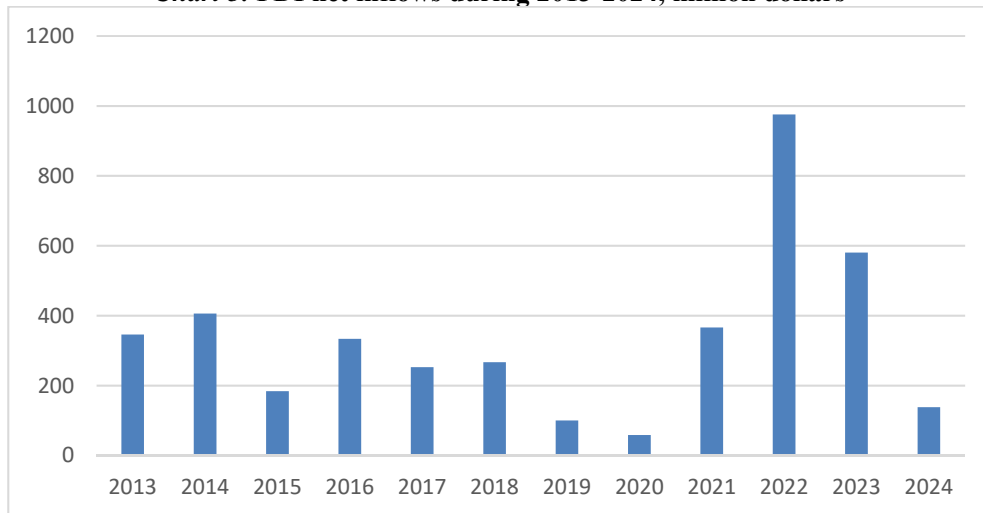
Analyzing data in Chart 4, we notice that in general there exists an inverse relationship between the Brain Drain Index and the unemployment rate in Armenia. The strongest effect appears between 2019 and 2022, when both indicators move in opposite directions. So as in the case of average yearly salary, we can state that the brain drain index level is not explained by the unemployment rate in Armenia, and there exist other factors that strongly affect the brain drain index.

Brain drain remains a crucial issue for the development of Armenia, if not in the short run, then in the long run definitely. High-skilled emigration can generate significant

⁴ Caucasian Research Resource Centers, “Migration and Skills in Armenia”, European Training Foundation, 2013.

benefits when supported by appropriate institutions, such as substantial remittance inflows, the transfer of knowledge, and increased foreign direct investment and trade. We already presented the remittances' impact on RA's economy (see Chart 1), and in the case of remittances, in the case of FDI net inflows, the impact is not significant (see Chart 5).

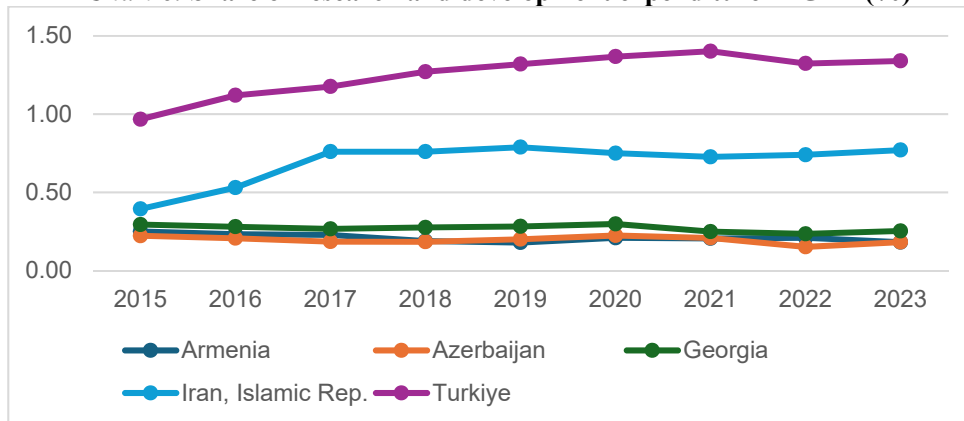
Chart 5. FDI net inflows during 2013-2024, million dollars



Source: World Bank Group, World Development Indicators 2025

Analyzing the Chart 5 data, we can state that in the case of Armenia, significant FDI inflows were not noticed during 2017-2014. Noticeable growth in 2022 is mainly explained by geopolitical and economic events (Russian-Ukrainian war). Moreover, as we can see in 2023 and 2024, we have a decreasing tendency of FDI net inflows to RA's economy.

Chart 6. Share of research and development expenditure in GDP (%)



Source: World Bank Group, World Development Indicators 2025

In the case of human capital development, knowledge transfer, and decreasing the innovation gap effects of skilled migration, it tends to present the "brain drain" as an opportunity for sending countries (Mariani F., 2008). In order to find out the effects of "brain drain" on human capital development, knowledge transfer, and innovation gaps, we analyzed the share of research and development expenditure in GDP. As we can see from Chart 6, the share of research and development expenditures in GDP is very close for Armenia, Georgia, and Azerbaijan. Moreover, in the case of Armenia, the share of research and development expenditures in GDP has not increased during 1997-2023 but decreased from 0.25% to 0.18%. Comparing with Armenia, Georgia and Azerbaijan the share of research and development expenditures in GDP is significant in Iran and Turkey.

Table 1. Researchers in research and development (per million people)

	2021	2022	2023
Armenia	-	1187	1039
Azerbaijan	1743	1702	1663
Georgia	1702	1808	1768
Iran	2239	-	-
Turkey	2209	2478	-

Source: World Bank Group, World Development Indicators 2025

And finally, in Table 1, we presented the number of researchers in research and development per million people. Analyzing Table 1, we notice that in Armenia the number of researchers in research and development (per million people) is the smallest among Azerbaijan, Georgia, Iran and Turkey. Armenia lags behind other countries in the region in terms of both funding and the number of researchers, which may limit opportunities for scientific productivity and innovative development. In general, we can indicate that the main centers of scientific research potential in the region are Turkey and Iran, while funding for science and human resource development in the South Caucasus countries remains a challenge. The regional comparison suggests a positive association between R&D investment and the availability of research personnel. Countries with higher R&D expenditure, such as Turkey and Iran, maintain substantially larger research communities, whereas Armenia exhibits both relatively low R&D intensity and a declining number of researchers. These patterns are consistent with the hypothesis that insufficient investment in research and innovation contributes to the emigration of highly skilled workers, thereby exacerbating brain drain and weakening the country's long-term innovation and growth potential.

Conclusion

The initial objective of this study was to investigate the scale, drivers, and consequences of high-skilled emigration from Armenia. The empirical findings, however, demonstrate that traditional macroeconomic indicators, specifically average wages and unemployment rates, do not sufficiently explain fluctuations in Armenia's Brain Drain Index during 2013–2024. The absence of a strong and stable relationship between these variables suggests that the determinants of high-skilled emigration extend beyond short-term labor market conditions.

The empirical analysis for 2013–2024 indicates that Armenia’s Brain Drain Index has demonstrated an upward trend, with fluctuations influenced more strongly by geopolitical shocks, migration networks, and institutional factors than by wage levels or unemployment rates alone. Rising salaries and moderate improvements in macroeconomic indicators have not been sufficient to reverse outward mobility trends. At the same time, remittances constitute a significant stabilizing factor for the Armenian economy, while foreign direct investment inflows remain volatile and largely influenced by external developments. These findings suggest that Armenia’s growing reliance on external inflows does not compensate for the gradual erosion of its domestic human capital base.

Given this evidence, policy responses must move beyond narrowly defined retention strategies. First, strengthening migration data governance is essential. The absence of comprehensive and integrated migration statistics constrains evidence-based policymaking. Establishing coordinated inter-agency data systems, harmonizing migration indicators, and improving monitoring of exits and returns would enhance institutional capacity and policy design. Second, Armenia’s migration framework could benefit from shifting conceptually from “brain drain prevention” toward “brain circulation management.” Rather than attempting to restrict mobility, policy instruments may focus on facilitating temporary migration, structured return, and knowledge exchange. Mechanisms such as streamlined recognition of foreign qualifications, targeted reintegration incentives for returnees, and sector-specific programs in strategically important industries (healthcare, IT, engineering, education) could mitigate long-term human capital losses. Third, diaspora engagement requires deeper institutionalization. Armenia’s extensive global diaspora represents not only a source of remittances but also a potential channel for knowledge transfer, innovation partnerships, and productive investment. Structured cooperation platforms linking diaspora professionals with domestic universities, research institutions, and private-sector actors may enhance technology diffusion and entrepreneurial development without requiring permanent return. Fourth, migration policy should be integrated into broader economic risk management strategies. As demonstrated by the sharp shifts following geopolitical shocks, Armenia’s migration dynamics are highly sensitive to external developments. Coordinated bilateral and regional cooperation frameworks, combined with domestic institutional strengthening, would improve resilience and labor mobility governance.

Countries such as Turkey and Iran, which invest more intensively in research and development and maintain larger research communities, exhibit lower levels of brain drain. In contrast, Armenia combines relatively low R&D expenditure and a declining number of researchers with one of the highest Brain Drain Index values in the region. These findings support the argument that insufficient investment in research and innovation may contribute to the emigration of highly skilled individuals, thereby weakening the country’s scientific potential and long-term economic growth prospects.

In conclusion, high-skilled emigration represents a complex structural challenge for Armenia. While migration generates measurable short-term benefits through remittances and transnational networks, the persistent rise in skilled outflows poses long-term risks to human capital accumulation, fiscal capacity, and sustainable growth. The policy objective, therefore, should not be the elimination of migration, but its strategic management. Without comprehensive data systems, strengthened institutions, and

targeted human capital policies, Armenia's development trajectory may remain constrained by the continued externalization of its skilled workforce.

This research was conducted as part of the grant project 25RG-5B128, "Improvement of RA economic risk management mechanism in the context of regional developments", funded by the Scientific Committee of the Republic of Armenia.

References

- Айрапетян Г.Р. 2016. «Армянская диаспора и внешнеэкономические связи Армении», Трансформация системы мирохозяйственного взаимодействия в контексте современных глобальных вызовов, Ростовского Государственного Экономического Университет.
- Aleksandr V. Gevorgyan, 2023. "Enhancing Development through Diaspora Engagement in Armenia", United Nations International Organization for Migration.
- Berry, R. Albert, and Ronald Soligo. 1969. "Some Welfare Aspects of International Migration." *Journal of Political Economy* 77 (5): 778–94.
- Bhagwati, Jagdish, and Koichi Hamada. 1974. "The Brain Drain, International Integration of Markets for Professionals and Unemployment: A Theoretical Analysis." *Journal of Development Economics* 1 (1): 19–42.
- Caucasian Research Resource Centers, "Migration and Skills in Armenia", European Training Foundation, 2013.
- Central Bank of Armenia. (2013–2024). Total money transfers of individuals received from abroad through commercial banks of the Republic of Armenia.
- Fabio Mariani, 2008. Brain Drain, R&D-Cost Differentials and the Innovation Gap, *Recherches Économiques de Louvain / Louvain Economic Review*, Vol. 74, No. 3 (2008), pp. 251-272.
- Haykanush Chobanyan, "Assessing Armenia's Migration Strategy for 2017-2021", International Centre for Migration Policy Development. 2019
- Innovation for Sustainable Development, Review of Moldova, United Nations Economic Commission for Europe, Geneva, 2021.
- International Organization for Migration, Labor Migration in Armenia. Existing Trends and Policy Options, 2012.
- IOM ARMENIA MISSION STRATEGY (2022-2025), available at https://crisisresponse.iom.int/sites/g/files/tmzbd11481/files/appeal/documents/IOM-Armenia-Country-Strategy_22-25.pdf
- Paolo Contini, Letizia Carrera, 2022. "Migrations and culture. Essential reflections on wandering human beings", *Frontiers in Sociology*.
- Stark Oded, Christian Helmenstein, and Alexia Prskawetz. 1998. "Human Capital Depletion, Human Capital Formation, and Migration: A Blessing or a 'Curse'?" *Economics Letters* 60 (3): 363–67.
- Stark Oded, Wang Yong. 2002. "Inducing human capital formation: migration as a substitute for subsidies". *Journal of Public Economics*, Elsevier, vol. 86(1), pp. 29-46.
- Tiankuo Li, 2025. "Influence of Brain Drain in Developing Countries", *Advances in Economics Management and Political Sciences* 203(1): pp. 64-69.
- World Bank Group. (2013–2024). *World Development Indicators*.
- World Population Review. (2017–2024). *Brain Drain by Country*.

FACTOR-BASED PRIORITIES OF NATIONAL POTENTIAL IN THE REPUBLIC OF ARMENIA: THE CASE OF YEREVAN STATE UNIVERSITY

AMALYA SARIBEKYAN* , ANNA HAKOBJANYAN** 
VARDUSH GYOZALYAN*** 
Yerevan State University

Abstract: National potential, as a multi-component concept, is interpreted in the theoretical literature not only through material resources, but also within the framework of the interconnection between social capital, human capital, and institutional capacities, which condition opportunities for development and resilience.

The primary aim of this article is to identify public perceptions of the factors constituting the national capacity of the Republic of Armenia and the priorities attributed to them, from the perspective of the academic staff and administrative employees of Yerevan State University (YSU). The study was conducted in a pilot format through a sociological survey, followed by an integrated (quantitative and qualitative) analysis of the collected data. A total of 220 employees participated in the survey. The findings indicate that the overwhelming majority of respondents prioritize social-capital factors within the components of national capacity—particularly human capital and the educational/knowledge factor—whereas natural resources are largely regarded as a less important component. At the same time, an interesting inconsistency is observed: while 65% of respondents assess intellectual potential as a key factor in coping with the country's socio-economic challenges, only 45% assign a high role to educational institutions (including YSU) in the same context, which points to a gap between recognizing the importance of intellectual potential and institutional trust in its realization. In the responses to the open-ended questions, respondents emphasize the need for a substantial improvement in the quality of education and continuous changes within the education system as a prerequisite for a more effective realization of national capacity. They also highlight, in the context of university reforms, issues related to institutional capacities, individual motivation, and the disproportionate distribution of the burden of decision-making and implementation, all of which require clearly articulated overarching development strategies.

* **Amalya Saribekyan** – PhD in Economics, Professor of Economics at the YSU Chair of Management and Business

E-mail: amalya.saribekyan@ysu.am ORCID: <https://orcid.org/0009-0002-8683-5780>

** **Anna Hakobjanyan** – PhD in Economics, Associate Professor at the YSU Chair of Management and Business

E-mail: annahakobjanyan@ysu.am, ORCID: <https://orcid.org/0009-0005-6420-6766>

*** **Vardush Gyozyalyan** – PhD in Economics, Associate Professor at the Chair YSU of Management and Business

Email: vardushgyozalyan@ysu.am ORCID: <https://orcid.org/0009-0009-7876-7651>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 23.09.2025

Revised: 19.10.2025

Accepted: 19.06.2026

© The Author(s) 2026

Key words: *socio-economic development, national potential, physical capital, social capital, intellectual potential, public perceptions, Yerevan State University, teaching faculty and administrative staff*

Introduction

The resource-driven security of socio-economic development* and a country's overall investment environment are primarily shaped by national potential and the extent to which it is fully unlocked and harnessed. National potential comprises both tangible and intangible resources influenced not only by a society's cultural and spiritual life, value system and capacity for self-organization but also by its educational, financial and natural resources. These interconnected factors create a reciprocal relationship: economic development drives social progress, while society, in turn, influences economic processes steering the course of qualitative economic transformation and restructuring. Over time, this interaction gives rise to new socio-economic realities. Amid global and local shifts, socio-economic systems have undergone ideological, conceptual, political and structural changes, leading to fundamental transformations. *As a result, they have entered a new phase of development, which requires that emerging priorities and strategic approaches be clearly articulated.*

Since the physical factors shaping national potential remain constant at any given moment in time (we have what we have), *social capital* emerges as a key determinant in maximizing the effective use of economic potential. Its role has become especially crucial in view of the ongoing social, political, socio-economic and psychological shifts in Armenia. In practice, social capital forms and develops through the continuous interaction and transformation of its four core components – *culture, knowledge, human capital and institutional foundations*, where social norms, networks and the level of trust in the state-society relations play a vital role. Public perceptions with regard to the importance and priorities of national potential in socio-economic development strongly impact the formation and reinforcement of these components. The comprehensive, multi-phase research envisioned by the authors seeks to look into these perceptions and their underlying causal relationships. *This article, however, presents the findings of a focused pilot study examining how the teaching faculty and administrative staff of Yerevan State University (YSU) perceive the key factor-based priorities of national potential.*

With its strong foundation of intellectual capital and academic excellence, YSU has long played an essential role in shaping the country's socio-economic development, driving both transformative change and gradual progress. Given this, exploring how the YSU teaching faculty and administrative staff, who are the driving force behind the university's development, view the key factors of national potential is both relevant and timely. This study sheds light on how the scientific community and the intellectual elite see the country's current situation, tackle key challenges and build mutual trust and unity.

* To provide a more comprehensive assessment of the qualitative and quantitative characteristics of the socio-economic development, it is advisable to examine social and economic phenomena in the context of their interconnection and interaction viewing them as a single, integrated system.

Literature Review

In contemporary theories of socio-economic development, national potential is viewed as a multidimensional system whose effective realization depends not only on material and natural resources, but also on the interaction between human capital, knowledge resources, social capital, and institutional capacities. Recent decades of research demonstrate that, within the context of global competitiveness and long-term development, the significance of intangible resources has substantially increased, particularly through education, knowledge, trust, and forms of social cooperation.

Contemporary studies of human capital regard higher education not merely as a system for the transmission of professional knowledge, but as a strategic institution of national development. A bibliometric analysis conducted in 2026, encompassing 766 scholarly works published between 2000 and 2024, demonstrates that over the last two decades the role of higher education has transformed from the classical model of knowledge transmission toward functions associated with human capital formation, adaptability, innovation, and the promotion of long-term socio-economic sustainability (Jiang et al., 2026). The authors emphasize that the effectiveness of educational systems increasingly depends on their ability to generate adaptive skills, institutional flexibility, and innovation-oriented competencies.

Within the framework of the knowledge economy, national competitiveness is determined less by the availability of natural resources and more by the capacity to create, reproduce, and apply knowledge. Contemporary research highlights that higher education institutions function as key hubs for the accumulation of knowledge capital and social reproduction, shaping not only professional competencies, but also mechanisms of public trust, cooperation, and institutional integration. This approach is particularly relevant for small and developing countries, where human and intellectual resources often constitute the primary competitive advantage.

Within the structure of national potential, the concept of social capital occupies a particularly significant place, especially as it has recently been reconsidered within the field of higher education. A large-scale study conducted in 2025 demonstrates that social capital continues to be regarded as an important factor in educational effectiveness, academic cooperation, and knowledge transfer (Gentry et al., 2025). The authors particularly emphasize that trust, social networks, and collaborative environments exert a substantial influence on educational outcomes, institutional engagement, and the circulation of knowledge.

The interconnection between social capital and educational outcomes is further confirmed by another study employing cross-classified multilevel models, which demonstrates that different forms of social capital—particularly mechanisms of trust and social support—have a significant impact on academic achievement in higher education (Oyefuga, E., Shakeshaft, C., 2023). The authors argue that, within educational environments, social capital not only supports individual advancement, but also forms the basis for institutional effectiveness and long-term development.

Contemporary research increasingly emphasizes the relationship between social capital and knowledge creation (Han et al. 2022). A study based on social network analysis demonstrates that, within higher education environments, the intensity of knowledge exchange and learning effectiveness are directly conditioned by the density of social ties and the level of collaboration. Such findings indicate that social capital

functions not only as a resource of social cohesion, but also as a critical resource for knowledge productivity.

The interaction between social capital and institutional development continues to occupy an important place in contemporary economic and sociological research. Research findings indicate that trust-based social capital exerts a substantial influence on institutional effectiveness and development, particularly in developing countries (Baliamoune-Lutz, M. 2011). Similarly, trust positively affects the accumulation of human capital and enhances the adaptive capacities of economic and social systems (Bjornskov, C., 2011).

The significance of education, scientific potential, and institutional trust becomes particularly pronounced within the structure of national potential in post-conflict and crisis-affected societies. Contemporary post-conflict development literature emphasizes that educational systems and academic institutions may serve as important platforms for social recovery, public cohesion, and the formation of long-term resilience (Milton, S., Barakat, S. 2016). At the same time, studies demonstrate that such societies often experience a contradiction between the high valuation of intellectual potential and declining trust toward educational or state institutions, which limits the full realization of national potential.

Within the framework of these theoretical approaches, the study of the national potential of the Republic of Armenia acquires particular relevance. Post-war social and psychological transformations, global and regional instabilities, migration processes, and the reconfiguration of public trust create new conditions for rethinking national development priorities. In this context, the examination of academic community perceptions makes it possible to assess how views regarding the priorities of national potential are formed and what role is attributed to educational and scientific institutions in the socio-economic development of the country.

Methodology

The pilot study presented in this article was designed in line with a mixed-methods approach, combining quantitative descriptive analysis with qualitative interpretation. The target population comprised the academic staff and administrative personnel of Yerevan State University (YSU), as they represent a key segment of the academic environment whose perceptions are particularly relevant for assessing the priority ranking of the factors shaping national potential. Data were collected through a structured online questionnaire (N = 220, approximately 10.7% of the target population), ensuring voluntary participation and adherence to basic ethical principles. The questionnaire included: (a) socio-demographic characteristics (age group, gender, and occupational status); (b) a prioritization task covering seven factors of national potential, rated on a 1–7 scale (1 = highest priority); (c) several Likert-type evaluative items on a 1–5 scale (e.g., regarding the role of intellectual potential and educational institutions); and (d) open-ended questions addressing perceived challenges and possible solutions. Quantitative data were processed using statistical techniques (frequencies, percentage distributions, and comparative observations across subgroups), while responses to open-ended items were analyzed through content and thematic analysis, involving the coding of meaning units and the identification of core thematic axes. This combined approach

made it possible to present both a measurable profile of factor priorities and a qualitative account of the underlying rationales and institutional perceptions that inform them.

Public Perception of the Priorities of Factors of National Potential in Socio-Economic Development

For centuries, there has been a prevailing belief that a country's economic success as well as the well-being and development of its population largely depend on its natural resources. However, the modern history of economic developments has shown that beyond simply owning resources, how efficiently they are allocated and used is far more important. In today's globalized world, economic and socio-political developments are increasingly interconnected intensifying their interactions and leading to political, economic and social imbalances. Of particular concern are the distortion of value-added distribution mechanisms among production participants (in terms of an unequal distribution of income), growing social polarization and deteriorating living standards especially in developing countries, including Armenia. In addition to the unequal distribution of national income, the uneven allocation of national wealth remains a major issue in some economies. Furthermore, global wealth is also distributed rather unevenly across different income groups of a country (Gyozalyan, 2022).

The mixed outcomes of globalization, which gained momentum in the late 20th century as well as the growing income polarization became more evident in the early 2000s, when the international trade volumes surged fueling rapid global economic growth. Before the financial crisis, developed countries – home to just 15.6% of the world's population – accounted for 47% of the global GDP and nearly 50% of international trade. These countries also held around 75% of the world's economic and scientific-technical potential (Saribekyan, 2010). The growing incomes on one hand and the declining prices on the other further increased consumption levels. By 2007, the global GDP had nearly doubled compared to the mid-1990s, with the growth in developing countries outpacing that of developed nations by about 3.6 times ((Trading Economics, 2024).

However, the unprecedented financial crisis of 2008-2009 left a restraining impact on the post-crisis recovery. The first decade after the crisis was marked by slowing global economic growth (World Bank 2023). By 2019, the global GDP had only increased by 30% compared to 2010 with developed countries reporting a 20% growth and developing countries around 57% growth. The situation worsened with the outbreak of the COVID-19 pandemic and its aftermath (Saribekyan, 2023). The third decade of the 21st century started with even more unfavorable developments for the global economy, including the ongoing pandemic, sharp decline in economic growth rates, persistent inflation and rising resource costs.

Thus, states as well as various geopolitical and geo-economic power centers that had long benefited from globalization and integration, currently face the urgent need for rethinking the future.

According to the World Bank's 2024 forecasts, economic growth is expected to decline in nearly half of all countries with developing economies taking a significant hit (World Bank, 2023).

Against the backdrop of global developments, Armenia's socio-economic dynamics have not shown particularly positive trends. In addition to the ongoing challenges, new issues have emerged. In recent years, Armenia's economic growth and development have been highly volatile. In 2019, the country's GDP grew by about 7.6%, but in 2020, due to the combined effects of the COVID-19 pandemic and the war, the GDP decreased by the same 7.6%.

Between 2021 and 2023, the GDP grew by 5.7%, 12.6% and 8.7%, respectively (World Bank 2024). This growth was largely driven by new factors, particularly the increase in human and financial inflows into Armenia, mainly from Russia due to the Russia-Ukraine conflict and its broader geopolitical effects. Additionally, the rise in income during this time contributed to an additional boost in demand in the domestic market (ArmStat 2022). However, it is important to highlight that despite the economic growth in recent years, the poverty rate, though slightly reduced, has remained high. In 2021-2023, the poverty levels in the country stood at 26.5%, 24.8% and 23.7%, respectively (ArmStat 2023, 2024). This suggests that the economic growth was not evenly distributed across society and did not lead to a significant improvement in the overall well-being of the population.

Given the post-war sentiments in society, the prevailing emotional distress and the negative expectations, the complex social challenges arising from the loss of Artsakh and the resulting migration flows, the solution to the current situation requires innovative approaches that are radically different from those of the past. These approaches should be rooted in the present circumstances and serve as the foundation for changes that create new conditions for progress.

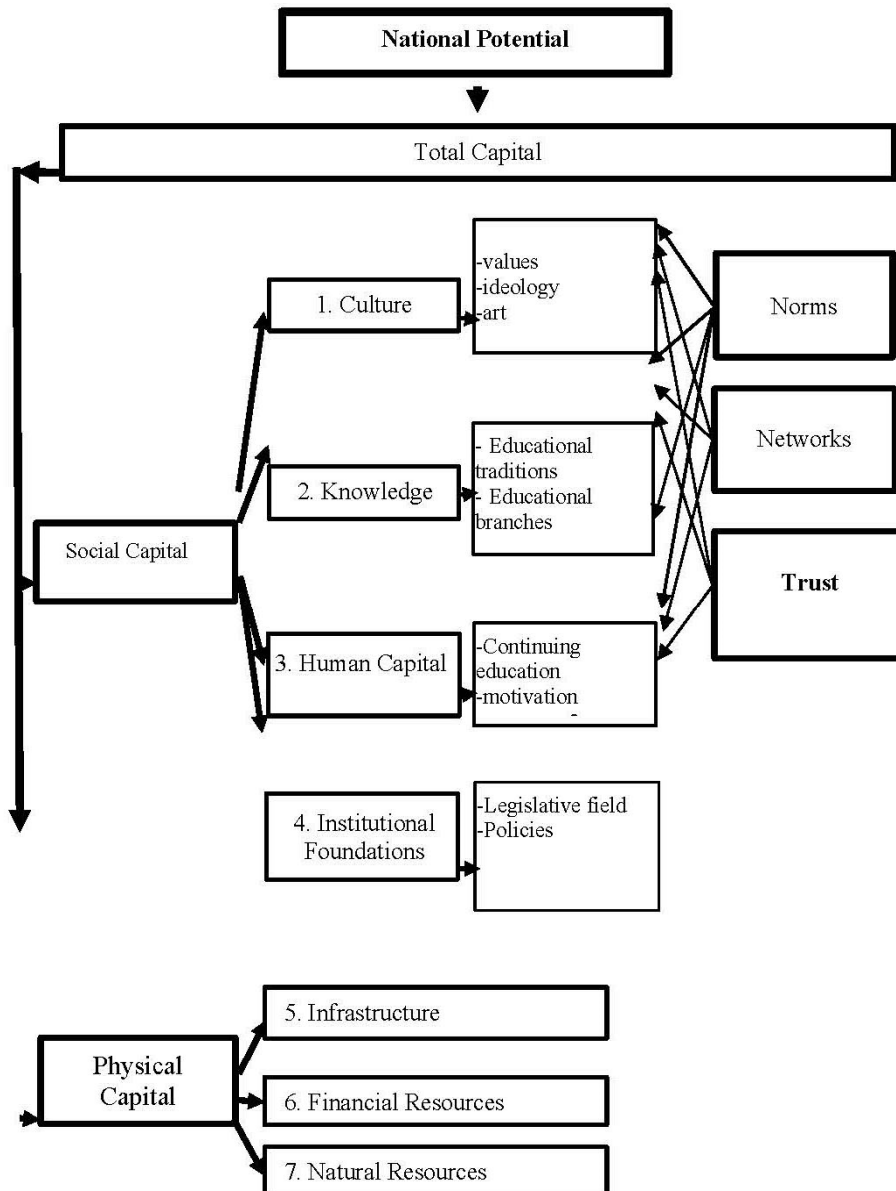
In view of the global and local realities and challenges, the social component of socio-economic development is becoming increasingly important in the evolving methodologies of periodic reports by leading international organizations¹. It highlights the qualitative side of economic growth more starkly. Social capital, with its significant synergistic potential, can improve the investment efficiency of the other components of national potential, such as natural resources, financial resources and infrastructure, ultimately contributing to the development of a more effective socio-economic system (Saribekyan, 2012) (see Figure 1).

The developments in economic and social life are often interpreted through the lens of a country's *cultural characteristics* and *national mindset*. These, in turn, are influenced by public perceptions of the factor-based priorities, patterns and cause-and-effect relationships.

When tackling these issues, it is crucial to consider public perceptions with regard to prioritizing human potential (qualities, abilities, skills and the possibility of continuously developing and expanding them) as well as education and educational capital.

¹ Particularly, the Global Competitiveness Report, published by the World Economic Forum (International Monetary Fund), which assesses countries' capacities and capabilities in ensuring a high level of well-being, has revised its competitiveness assessment methodology since 2018. A key emphasis of the updated methodology is that a country's development cannot be measured by a single indicator (such as GDP). Based on this approach, three key aspects are highlighted to characterize a country's continuous development: competitiveness, growth (in the context of equitable distribution) and sustainability (from an environmental perspective). For more details, see Global Competitiveness Report, Special Edition, IMF, World Economic Forum, 2020, How Countries Are Performing on the Road to Recovery, Appendix A – Transformation Readiness Framework: Methodology and Definitions, pp. 63–73.

**Figure 1. Components of National Potential
(Social Capital: Norms, Networks, Trust)**



Source: Saribekyan, A. 2012. *Contemporary Issues of Socio-Economic Development*. Yerevan, pp. 10-11.

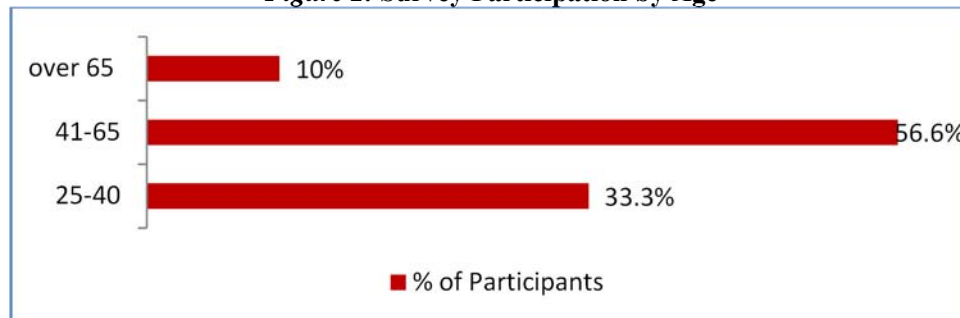
Research Findings

Discussions on various platforms about the realities and challenges faced by Armenia often highlight the role and importance of the scientific community and intellectuals as well as the fact that this role is often underestimated and has limited opportunities for realization. However, various opinions, whether expressed by experts or non-experts, are often based on personal observations and subjective reasoning, which weakens the grounds on which they can be proven.

Within the scope of this study, the teaching faculty and administrative staff of YSU were selected as a target group since they represent a broad segment of the scientific community and intellectuals. A sociological survey was conducted among them to explore their perceptions regarding the factor-based priorities of national potential and possible solutions to the existing issues.

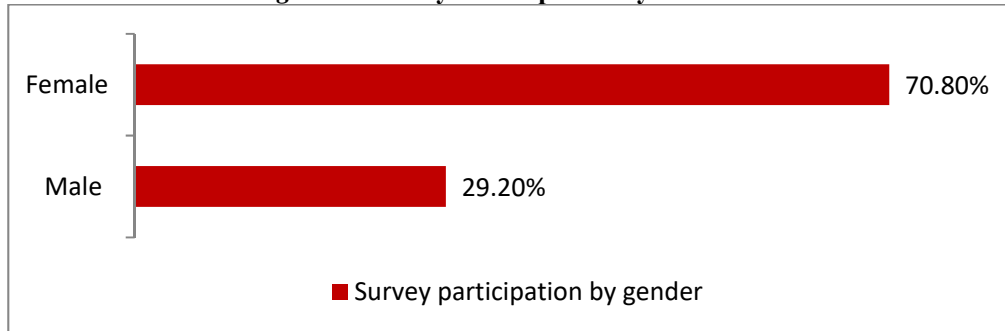
The survey results enable us to generalize and analyze, from a scientific perspective, the views of the staff of an institution that has served as the driving force of Armenia's higher education system for decades – Armenia's Alma Mater – which has played a central role in the development of human capital, regarding the key issues facing the nation and the priorities for addressing them. The analysis of the survey data has produced notable findings. A total of 220 individuals participated in the survey, accounting for 10.7% of Yerevan State University's teaching faculty and administrative staff.

Figure 2. Survey Participation by Age



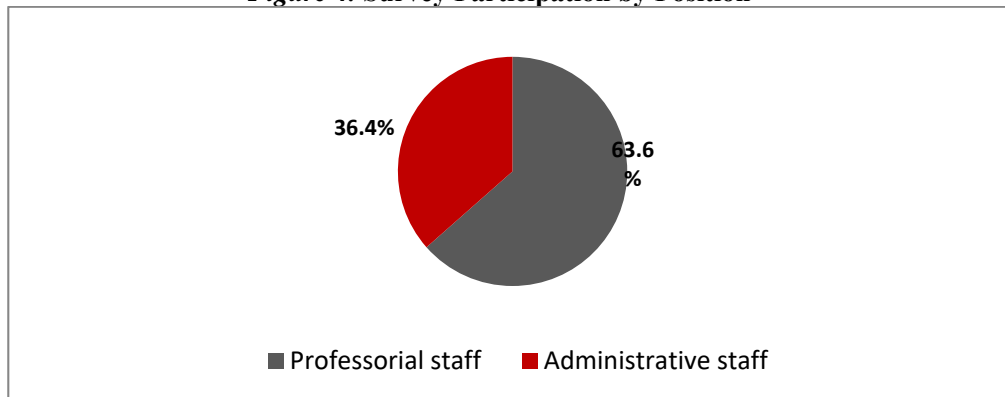
Source: Developed by authors.

The largest proportion of respondents came from the 41-65 age group, which can be partly attributed to the historical memory of this group, as they were direct participants and witnesses of the 1988 national revival. As a result, the issues raised in the survey were particularly relevant to them in the context of today's realities. The passivity observed in those over 65 is likely due to their limited use of modern technologies and digital tools. However, the remarkably low participation rate among young people is rather concerning. This can be attributed to a strong sense of demotivation regarding social developments in the post-war period.

Figure 3. Survey Participation by Gender

Source: Developed by authors.

Among the respondents, 70.8% were women compared to 56% of the total teaching faculty and administrative staff. This discrepancy can be attributed to women's greater willingness to participate in online surveys and their stronger interest in the issues discussed.

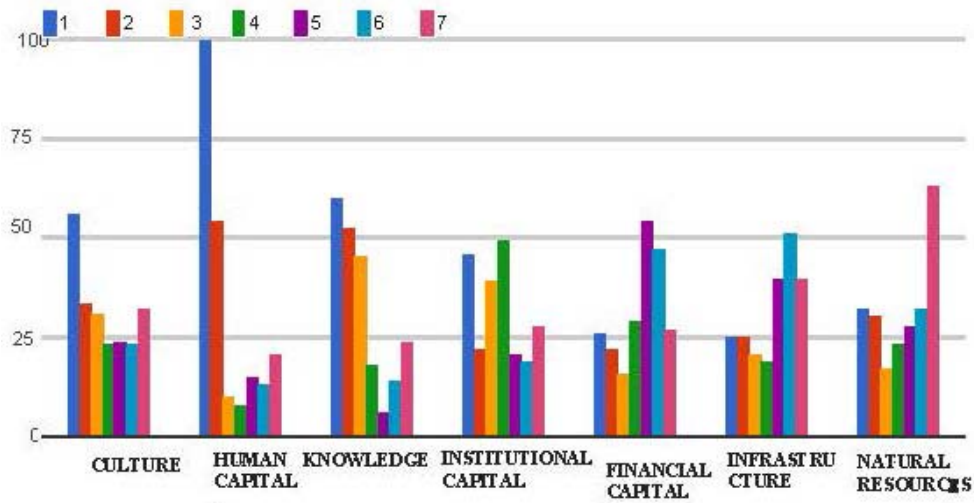
Figure 4. Survey Participation by Position

Source: Developed by authors.

Among the survey participants, 63.6% (140 individuals) were faculty members and 36.4% (80 individuals) represented the administrative staff. Notably, the proportion of the participating faculty members constitutes 16.3% of the total faculty, while the participating administrative staff account for 28% of the total administrative staff.

This difference can be attributed to the more active role of the administrative staff in decision-making processes related to the strategic development of Yerevan State University. As a result, they tend to show a greater interest in the academic environment and the factors influencing social and economic developments.

Figure 5. The distribution of the seven factors of national potential according to their priorities assessed based on a 1-7 scale where 1 denotes the highest priority.



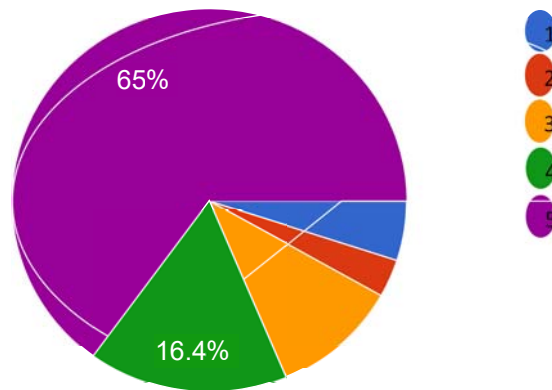
Source: Developed by authors.

The data presented in Figure 5 demonstrates that most respondents prioritize the factors of social capital. Specifically, out of 220 participants, 100 gave the highest priority to human capital, while the majority placed the least importance on natural resources.

This assessment fully reflects, both in social and YSU’s future development priorities, the importance of developing human resources and integrating them in the entire decision-making and implementation process, as perceived by the staff.

It is noteworthy that the perception of the staff further places greater emphasis on the knowledge factor, particularly in relation to the education and scientific systems. As regards strategic management priorities, decision-making – seen as the result of generating perceptions – should focus on creating such institutional structures that ensure the realization of the synergistic entirety of science and education. The responses to the additional questions included in the survey revealed the following distribution:

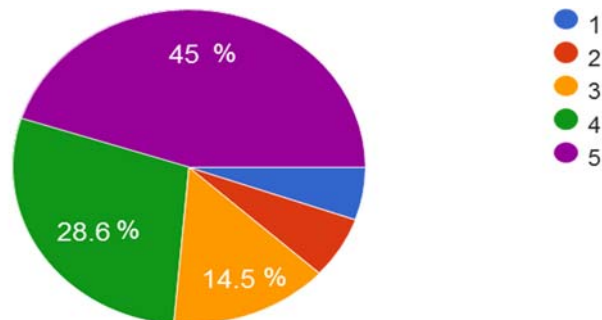
Figure 6. Assess the role of intellectual potential in addressing the socio-economic development challenges faced by the country (on a scale of 1 to 5 with 5 being the highest).



Source: Developed by authors.

While 65% of the respondents consider intellectual potential crucial for addressing the socio-economic challenges faced by the country, perceptions vary significantly when the same question pertains to the role of educational institutions, YSU in particular.

Figure 7. Assess the role of educational institutions, particularly YSU, in addressing the socio-economic development challenges faced by the country (on a scale of 1 to 5 with 5 being the highest).



Source: Developed by authors.

Only 45% of the respondents believe that educational institutions, particularly YSU, play a crucial role in addressing the socio-economic challenges faced by the country with 28.6% rating the importance of this role as 4 out of 5.

Approximately 65% of the respondents view intellectual potential as critical, but the percentage drops by about 20 points when it comes to the role of educational institutions. This raises the question of where and how society's intellectual potential should be prioritized. The answer to this question can be partly found in the open-ended comments made by the respondents. Out of 220 respondents, only 74 left comments and among them 33 underlined the need to improve the quality of education and the education system as key to realizing the country's national potential. In other words, it will be possible to fully realize intellectual potential through reforms in the education system and improvements in the quality of education.

Within the scope of YSU reforms, the main challenges are the lack of institutional capacity and individual motivation as well as the uneven distribution of the decision-making and implementation burden. Addressing these challenges requires clearly formulated overarching development strategies.

Conclusion

The factors constituting national potential, particularly its social component, significantly influence the trajectory of the country's socio-economic development. Equally crucial are the public perceptions of these factors and their priorities as they underpin the formation of social sentiments and the resulting shifts.

The low participation rate (10.7% of all respondents) in the expert survey conducted among the staff of Yerevan State University, an institution centered around intellectuals, reflects that in the post-war phase the sense of distrust towards the future and the factors shaping it, the lack of initiative and a certain degree of indifference in Armenian society are also mirrored in this group.

Nevertheless, the perceptions of the survey participants reveal the objective priorities of national potential with a primary focus placed on human capital and the educational factor. In this context, the need for significant changes in the quality of the educational system has been stressed. These changes will enable to reassess the role of educational institutions, particularly that of YSU as a leading university, which, in turn, will ensure the effective realization of society's intellectual potential.

This study contributes to the national development discourse by shifting it from opinion-based and intuitive judgments toward an evidence-informed agenda, demonstrating that public priorities within national potential are centered on human capital and education, while at the same time revealing a trust gap regarding the capacity of educational institutions to realize that potential. Identifying this mismatch between "prioritization" and "institutional trust" provides a clear policy direction: to treat qualitative reforms in the education system not merely as a sectoral issue, but as a foundational prerequisite for national resilience and long-term development.

References

- Baliamoune-Lutz, M. (2011). *Trust-based social capital, institutions, and development*. *Journal of Socio-Economics*, 40(4), 335–346. <https://doi.org/10.1016/j.socec.2010.12.004>
- Bjørnskov, C. (2011). *Combating corruption: On the interplay between institutional quality and social trust*. *Journal of Law and Economics*, 54(1), 135–159. <https://doi.org/10.1086/652421>
- Gentry, A. N., Martin, J. P., & Douglas, K. A. (2025). *Social capital assessments in higher education: A systematic literature review*. *Frontiers in Education*, 9, 1498422. <https://doi.org/10.3389/educ.2024.1498422>
- Gyozalyan, V. (2022). *Economics and Social Justice*. Yerevan: Edit Print, 254 p. (in Armenian)

- Han, S.-H., Oh, E. G., & Kang, S. P. (2022). *Social Capital Leveraging Knowledge-Sharing Ties and Learning Performance in Higher Education: Evidence From Social Network Analysis in an Engineering Classroom*. AERA Open, 8. <https://doi.org/10.1177/23328584221086665>
- Jiang, D., Abd Majid, M. Z., & Arham, A. F. (2026). *Exploring the evolution of higher education's role in human capital formation: A bibliometric analysis from 2000 to 2024*. Cogent Education, 13(1). <https://doi.org/10.1080/2331186X.2026.2618345>
- Lloyds Bank (2024). *The economic context of Armenia*. International Trade Portal. Available at: <https://www.lloydsbanktrade.com/en/market-potential/armenia/economical-context>
- Milton, S., Barakat, S. (2016). *Higher education as the catalyst of recovery in conflict-affected societies*. *Globalisation, Societies and Education*, 14(3), 403–421. <https://doi.org/10.1080/14767724.2015.1127749>
- Oyefuga, E., & Shakeshaft, C. (2023). *Social Capital and the Higher Education Academic Achievement: Using Cross-Classified Multilevel Models to Understanding the Impact of Society on Educational Outcomes*. *Youth & Society*, 55(1), 3–27. <https://doi.org/10.1177/0044118X211042912>
- Saribekyan, A.S. (2010). *Financial and Economic Crisis: Paths to Overcome and Post-Crisis Developments*. Textbook. Yerevan: Yerevan State University, pp. 70-77 (in Armenian)
- Saribekyan, A.S. (2012). *Contemporary Issues of Socio-Economic Development*. Yerevan, 200p. (in Armenian)
- Saribekyan, A.S. (2023). *Global Economic Growth Tendencies and Recessional Developments*. *Bulletin of High Technology*, 2(26), 28–36. <https://doi.org/10.56243/18294898-2023.2-28>
- Statistical Committee of the Republic of Armenia (ArmStat) (2022). *Socio-Economic Situation of the Republic of Armenia, January–August 2022*. Yerevan: ArmStat. (Published 05 Oct 2022), p. 105. Available at: <https://armstat.am/en/?nid=689>
- Statistical Committee of the Republic of Armenia (ArmStat) (2024). *Armenia – Poverty Snapshot over 2019–2022*. Yerevan: ArmStat. Available at: https://armstat.am/file/article/poverty_2023_en_2.pdf
- Statistical Committee of the Republic of Armenia (ArmStat) (2024). *Poverty in the Republic of Armenia, 2023* (Infographics). Yerevan: ArmStat. Available at: <https://armstat.am/en/?id=1056&nid=157>
- Trading Economics (n.d.). *GDP Annual Growth Rate – Countries – List*. Available at: <https://tradingeconomics.com/country-list/gdp-annual-growth-rate>
- World Bank (2023). *Global Economic Prospects, January 2023*. Washington, DC: World Bank. doi:10.1586/978-1-4648-1906-3. (See fig. 1.1.C, p. 5). Available at: <https://thedocs.worldbank.org/en/doc>
- World Bank (n.d.). *GDP (current US\$) – Armenia*. World Development Indicators. Available at: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=AM>

ANALYSIS OF THE LABOR MARKET OF ARMENIA IN THE CONTEXT OF CONTEMPORARY CHALLENGES: SOCIO-ECONOMIC AND PSYCHOLOGICAL ASPECTS

ELENA KULCHITSKAYA* ,
Saint Petersburg State University

AMALYA GALSTYAN **
Yerevan State University

ELENA KADURA*** 
Saint Petersburg State University

Abstract: This article presents a multidimensional study of the labor market of the Republic of Armenia in the context of current global and regional challenges. The work integrates three analytical dimensions: a cross-country correlation analysis of macroeconomic and social indicators, a detailed characterization of the dynamics of the Armenian labor market in 2020-2024, and a sample-based psychological measurement of occupational stress among labor force participants.

A correlation analysis of 20 countries from the post-Soviet, Balkan, and Middle Eastern regions has revealed stable relationships between GDP per capita, the Human Development Index, the Knowledge Economy Index, and the Global Innovation Index. A characteristic gap for Armenia has been identified between a relatively high level of human potential and a comparatively lower degree of its economic realization within the middle-income group. The labor market analysis demonstrates positive employment dynamics while structural imbalances persist - gender inequality, a high level of chronic unemployment, and sectoral disproportionality. An empirical study of occupational stress (n = 234; 95% confidence level; confidence interval 6.5 percentage points) identified latent stress tendencies within the surveyed group rather than claiming direct generalization to the entire national workforce. The totality of the obtained results forms the basis for developing comprehensive recommendations in the field of state employment policy and the protection of workers' psychological health.

Key words: *labor market of Armenia; correlation analysis; Human Development Index; occupational stress; employment; unemployment; Global Innovation Index; human capital.*

* **Elena Kulchitskaya**, PhD in Economics, Associate Professor at the Department of Management and Planning of Socio-Economic Processes, Saint Petersburg State University
E-mail: e.kulchitskaya@spbu.ru ORCID ID: <https://orcid.org/0000-0001-9193-2257>

** **Amalya Galstyan**, PhD in Economics, Associate Professor at the YSU Chair of Business and Management
E-mail: amalyagalstyan@ysu.am ORCID ID: <https://orcid.org/0009-0008-2027-5112>

*** **Elena Kadura**, PhD in Psychology, Associate Professor at the Department of Information Systems in Economics, Saint Petersburg State University
E-mail: e.kadura@spbu.ru ORCID ID: <https://orcid.org/0000-0002-0068-927X>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 23.04.2026

Revised: 12.05.2026

Accepted: 19.06.2026

© The Author(s) 2026

Introduction

The labor market is one of the key indicators of the state of the national economy and the social sphere of any country. For the Republic of Armenia, which is undergoing intensive structural transformations while simultaneously striving to integrate into the global economic space, the study of the regularities of labor market functioning acquires particular significance (Tiratsvyan, A., 2025). The country has demonstrated steady economic growth over the past decade, but this growth has not yet led to a proportional improvement in working conditions and the well-being of the population. Understanding the reasons for this discrepancy requires a comprehensive, multi-level analytical approach.

The relevance of this research stems from several interrelated factors. First, Armenia, as a small open economy, is particularly vulnerable to external shocks – geopolitical instability, volatility in commodity markets, and migration flows. These factors directly affect the labor market situation, creating specific challenges for employment policy (Galstyan, A., 2025). Second, the structural transformation of the Armenian economy is accompanied by significant imbalances in labor supply and demand: high unemployment in cities coexists with a shortage of qualified personnel in a number of industries, indicating deep institutional problems (Kurginyan, R., Gasparyan, A., & Harutyunyan, A., 2025).

Third, the growing international attention to the psychological dimension of work necessitates the study of occupational stress not only as an individual problem of the worker but also as a systemic phenomenon that reduces aggregate labor productivity and the innovative potential of the economy (Managhi, S., & Piao, H., 2022, Graversen, B. K., et al., 2023). Research conducted in various countries convincingly demonstrates that ignoring psychological factors when forming employment policy significantly reduces its effectiveness (Abla, E., et al., 2021). Thus, the study of occupational stress among the Armenian population fits into the broad context of assessing the country's human capital.

This work pursues three main objectives. The first is to establish how Armenia's macroeconomic indicators compare with similar data from comparable countries and what these comparisons say about the country's position in the coordinate system "economic development – human potential". The second is to trace the dynamics of the main labor market indicators of Armenia in 2020–2024, identifying both positive trends and persistent structural problems. The third is to characterize the level and specifics of occupational stress among the labor force of Armenia based on the data of an original empirical study (Kulchitskaya, E. V., Hakobjanyan, A. O., Galstyan, A. R., & Kadura, E. V., 2026).

The theoretical basis of the research has been formed by the concept of human capital developed in the works of leading economists (Diebolt, C., & Hippe, R., 2018; López-Pueyo, C., Jiménez, G., & Sanau, J., 2014), as well as by modern psychological models of professional stress (Graversen, B. K., et al., 2023; Abla, E., et al., 2021). The empirical base includes data from the Statistical Committee of the Republic of Armenia (Armstat, 2025), the World Bank (World Bank, 2023, World Bank, 2024), UNDP (UNDP, 2024), WIPO (WIPO, 2024), as well as the results of an original survey conducted by the authors in January–March 2026⁷. The methodological novelty of the work consists in combining quantitative methods of cross-country comparison, statistical analysis of time series, and psychodiagnostic tools into a single analytical framework.

Literature Review

The literature on labor markets in small open economies emphasizes that employment dynamics are shaped not only by the number of available jobs, but also by the quality of human capital, institutional flexibility, migration flows, and the ability of education systems to match current demand for competencies. In this context, human capital theory treats education, health, and professional skills as resources that can increase labor productivity and support innovation, but only when institutional and organizational conditions allow these resources to be used effectively.

Studies of Armenia's labor market point to a combination of positive employment dynamics and persistent structural constraints. These include gender asymmetry in labor force participation, differences between urban and rural labor markets, chronic unemployment, and mismatch between the professional profile of job seekers and employer demand. These findings justify the use of both macroeconomic indicators and detailed labor-market statistics in the present study.

A separate group of studies examines occupational stress as a factor affecting productivity, absenteeism, turnover, quality of work, and the innovative behavior of employees. International research shows that work stress should be considered not only an individual psychological issue, but also an organizational and socio-economic problem. For this reason, the present article combines socio-economic analysis with a psychodiagnostic survey of occupational stress.

The research gap addressed by this article is the lack of an integrated assessment of Armenia's labor market that simultaneously considers macroeconomic position, labor-market dynamics, and the psychological condition of workers. This approach makes it possible to analyze not only quantitative employment indicators, but also the human and psychological factors that may influence the realization of labor potential.

Methodology

The study was designed as a mixed socio-economic and psychological analysis consisting of three complementary stages. First, a cross-country correlation analysis was conducted to identify relationships between economic welfare, human development, education, labor-market indicators, and innovation potential. Second, the dynamics of Armenia's labor market in 2020-2024 were analyzed using official statistical data. Third, an empirical survey was conducted to measure occupational stress among labor force participants in Armenia.

For the cross-country stage, the sample included 20 countries from the post-Soviet, Balkan, and Middle Eastern regions. Eleven indicators were used: GDP per capita, GNI per capita, HDI, HCI, Education Index, education expenditure as a percentage of GDP, employment rate, unemployment rate, Doing Business index, Knowledge Economy Index, and Global Innovation Index. The observation period was 2022-2024, and the data sources included the World Bank, UNDP, WIPO, UNESCO, and national statistical sources.

The analysis of Armenia's labor market dynamics was based on the official data of the Statistical Committee of the Republic of Armenia for 2020-2024. The study considered labor resources, labor force participation, employment and unemployment

rates, chronic unemployment, applicants per vacancy, job-seeker placement, and employment by type of economic activity.

The psychological part of the research was conducted in January-March 2026 by means of an online questionnaire distributed through social networks and professional communities in the Republic of Armenia. The inclusion criteria were: residence in Armenia, age of 18 years or older, participation in the labor force as an employed person or as a person seeking employment, and voluntary consent to participate in the survey. After screening and removal of incomplete responses, the final sample consisted of 234 respondents.

The sample size was evaluated with reference to the labor force of Armenia, which is approximately 1.32 million persons. For a 95% confidence level, the achieved sample size corresponds to a confidence interval of approximately 6.5 percentage points. The authors acknowledge that a 5% margin of error would require a larger sample; however, for an exploratory socio-psychological study, the 95% confidence level and 6.5-point interval are sufficient to identify stable tendencies. To additionally assess the applicability of the data to broader patterns, the authors carried out factor analysis and validation of the structure of the obtained results.

As an additional validation step, factor analysis was applied to the standardized psychodiagnostic indicators in order to verify whether the survey results formed interpretable latent dimensions of occupational stress. The validation focused on the consistency of the integrated stress indicator with the theoretically expected components of perceived stress, emotional-cognitive reactions, occupational symptoms, and behavioral manifestations. This procedure was used to support the application of the sample data for identifying broader tendencies, while avoiding direct overgeneralization to the entire national workforce.

Sample formation was controlled by four substantive criteria: gender, age, place of residence, and employment sphere/type of employment. These criteria were used to prevent concentration of responses in a single demographic or occupational subgroup and to make the empirical material comparable with the structure of the Armenian labor force. The sample should therefore be interpreted as sufficiently representative for identifying general tendencies, while all conclusions are formulated with caution and without overstating direct national generalization.

Table M1. Sample description and grouping variables used in the psychological survey

Criterion	Categories/values recorded in the survey	Purpose in analysis
Sample size	n = 234 respondents	Empirical base for occupational-stress analysis
Gender	Women: 130 respondents (55.6%); men: 104 respondents (44.4%)	Comparison of stress levels by gender
Age	18+; grouped into age cohorts including under 20, 20-30, 31-40, 41-50, 51-60, and over 60	Identification of age-specific stress patterns
Place of residence	Urban and rural respondents	Comparison of stress levels by locality

Employment status	Employed respondents and unemployed/job-seeking respondents	Assessment of stress associated with employment status
Type of employment/employer	Public sector, private sector, self-employed/other employment categories	Assessment of stress by job-related characteristics

Source: Developed by authors.

The psychodiagnostic block combined several validated tools: the Perceived Stress Scale (PSS-10), the LESS II Emotional Schemas method, the Shcherbatykh stress-diagnosis method, the Fontana Professional Stress Scale, and a point assessment of stress symptoms. The combination of these instruments was selected after a comparative analysis of 31 stress-diagnosis methods and was intended to capture subjective stress perception, emotional-cognitive patterns, behavioral manifestations, symptoms, and the specifically occupational component of stress.

The questionnaire consisted of the following blocks: (1) socio-demographic data; (2) employment and workplace characteristics; (3) PSS-10 items measured on a five-point Likert scale from 0 (“never”) to 4 (“very often”); (4) LESS II statements measured on an agreement scale; (5) Shcherbatykh stress symptoms with dichotomous answers; (6) the Fontana scale with responses from 0 (“never”) to 3 (“almost always”); and (7) a point assessment of basic stress symptoms. The questionnaire structure is presented in Appendix A.

Raw scores obtained from the different methods were standardized and converted into a unified integrated stress indicator according to the model $S = 11 + 1.8 \times Z_1$. The interpretation scale used in the article - low stress below 14 points, moderate stress from 15 to 22 points, and high stress above 22 points - is therefore not an arbitrary raw-score division of one questionnaire, but a standardized interpretation of the combined psychodiagnostic result.

Cross-Country Correlation Analysis

To identify systemic interdependencies between key indicators of economic and social development, a sample of 20 countries has been formed: Armenia, Georgia, Azerbaijan, Kazakhstan, Russia, Turkey, Belarus, Moldova, Ukraine, Kyrgyzstan, Uzbekistan, Tajikistan, Iran, Serbia, North Macedonia, Albania, Montenegro, Bulgaria, Romania, Croatia. This group of countries has comparable historical experience, belongs to similar income groups (mainly lower-middle and upper-middle categories according to the World Bank classification), and is geographically close, which makes the comparative analysis methodologically correct (World Bank, 2024).

Eleven indicators have been selected as variables for the correlation analysis: GDP per capita (USD, PPP), GNI per capita (PPP), Human Development Index (HDI), Human Capital Index (HCI), Education Index, education expenditure (% of GDP), employment rate (%), unemployment rate (%), Doing Business index, Knowledge Economy Index (KEI), and Global Innovation Index (GII). The data have been obtained from official sources: the World Bank (World Bank, 2024), UNDP (UNDP, 2024), WIPO (WIPO, 2024), UNESCO, and aggregated databases (gtmarket.ru). The observation period is 2022–2024.

**Table 1. Correlation matrix of macroeconomic and social indicators
(n = 20 countries)**

	GDP/cap	GNI/cap	HDI	HCI	EduIdx	EdExp	Empl	Unempl	Doing Bus	KEI	GII
GDP/cap	1.000	0.962	0.871	0.580	0.555	-0.351	0.092	-0.170	0.508	0.750	0.716
GNI/cap	0.962	1.000	0.878	0.593	0.538	-0.312	0.108	-0.182	0.497	0.767	0.794
HDI	0.871	0.878	1.000	0.698	0.735	-0.426	0.074	-0.193	0.441	0.813	0.810
HCI	0.580	0.593	0.698	1.000	0.827	-0.285	0.061	-0.148	0.362	0.810	0.742
EduIdx	0.555	0.538	0.735	0.827	1.000	-0.219	0.082	-0.176	0.381	0.827	0.745
EdExp	-0.351	-0.312	-0.426	-0.285	-0.219	1.000	-0.118	0.204	-0.245	-0.318	-0.290
Empl	0.092	0.108	0.074	0.061	0.082	-0.118	1.000	-0.395	0.065	0.087	0.093
Unempl	-0.170	-0.182	-0.193	-0.148	-0.176	0.204	-0.395	1.000	-0.155	-0.198	-0.187
DoingBus	0.508	0.497	0.441	0.362	0.381	-0.245	0.065	-0.155	1.000	0.462	0.451
KEI	0.750	0.767	0.813	0.810	0.827	-0.318	0.087	-0.198	0.462	1.000	0.828
GII	0.716	0.794	0.810	0.742	0.745	-0.290	0.093	-0.187	0.451	0.828	1.000

Note: GDP/cap – GDP per capita; GNI/cap – GNI per capita PPP; HDI – Human Development Index; HCI – Human Capital Index; EduIdx – Education Index; EdExp – education expenditure, % of GDP; Empl – employment rate; Unempl – unemployment rate; DoingBus – Doing Business index; KEI – Knowledge Economy Index; GII – Global Innovation Index. Bold values indicate $|r| \geq 0.700$. Sources: World Bank (World Bank, 2024), UNDP (UNDP, 2024), WIPO (WIPO, 2024).

Analysis of the correlation matrix (Table 1) reveals several substantively meaningful clusters of relationships. The first and most powerful cluster is formed by indicators of economic welfare, human development, and innovation potential: GDP per capita, GNI per capita PPP, HDI, KEI, and GII show high pairwise correlations in the range $r = 0.716$ – 0.962 . The relationship between GDP and GNI per capita PPP is almost linear ($r = 0.962$), reflecting the consistency of the two standard measures of economic living standards¹⁷. The correlations of GDP with HDI ($r = 0.871$) and with KEI ($r = 0.750$) confirm the theoretically sound thesis that economic growth and human development mutually reinforce each other, although the direction of the causal relationship remains a subject of debate in the academic literature (Diebolt, C., & Hippe, R., 2018).

The second cluster is related to education and human capital. The Education Index and HCI show a high correlation with each other ($r = 0.827$), indicating their content proximity. Both indicators are also closely related to KEI ($r = 0.827$ and $r = 0.810$, respectively) – this confirms the hypothesis that the quality of a nation’s educational potential is one of the key drivers of the knowledge economy (Shi, S., & Wang, S., 2024; Ngo, H. P. T., 2023). The relationship between HCI and GII ($r = 0.742$) is also noteworthy: countries with higher human capital naturally demonstrate higher innovative potential, which corresponds to standard models of endogenous growth.

The labor market indicators – employment rate and unemployment rate – deserve special attention. Both are practically unrelated to most macroeconomic variables: the correlation of GDP per capita with the employment rate is only $r = 0.092$, and with the unemployment rate $r = -0.170$. This result, while unexpected, is well documented in the literature: richer countries do not necessarily have higher employment or lower unemployment. Developed economies often experience structural unemployment driven by technological change. At the same time, the relationship between the employment rate and the unemployment rate is negative ($r = -0.395$), albeit moderate – this reflects

a partial, but not complete, interchangeability of these indicators in the context of the sample.

The most counter-intuitive result is the negative correlation of education expenditure (% of GDP) with HDI ($r = -0.426$) and with GDP per capita ($r = -0.351$). At first glance, this contradicts the established views on the role of public investment in education. However, this pattern is well explained from the perspective of comparative analysis: poorer countries in the sample spend a relatively larger share of GDP on education, seeking to compensate for the lag in human capital, while richer countries achieve a high HDI with a smaller share of educational expenditure in GDP – due to a fundamentally different quality of education systems and more efficient use of resources. Thus, it is not that investment in education is harmful, but that its effectiveness, not its volume, plays a decisive role (Ngo, H. P. T.,2023).

Table 2. Indicators of Armenia in comparison with the sample averages (20 countries)

Indicator	Armenia	Sample average	Min in sample	Max in sample
GDP per capita, USD	8 501	13 420	5 260	35 210
GNI per capita PPP, USD	21 990	24 350	10 420	54 780
HDI	0,811	0,772	0,640	0,902
Education Index	0,749	0,728	0,580	0,878
Education expenditure, % of GDP	2,8	3,9	2,1	6,2
Employment rate, %	51,2	56,8	46,4	72,1
Unemployment rate, %	13,4	8,6	3,1	18,2
Human Capital Index (HCI)	0,58	0,62	0,47	0,81
Knowledge Economy Index (KEI)	4,21	5,48	2,84	8,92
Global Innovation Index (GII)	29,0	35,2	19,8	64,4
Doing Business index	74,5	67,3	52,1	86,8

Sources: World Bank (World Bank, 2024), UNDP (UNDP,2024), WIPO (WIPO,2024), UNESCO.

Comparing Armenia's indicators with the sample averages (Table 2) allows us to characterize its position in the system of cross-country coordinates. The most pronounced contrast is observed between the HDI value (0.811 – above the sample average of 0.772) and GDP per capita (USD 8,501 – significantly below the sample average of USD 13,420, while Armenia remains a middle-income economy in the World Bank classification). This gap indicates that Armenia has accumulated a significant stock of human potential, which, however, does not find full embodiment in economic productivity. This phenomenon is characterized in the international analytical literature as a “middle-income trap” – a situation where a country has a sufficient level of education and health of the population to move to a new growth trajectory, but cannot implement this transition due to institutional and structural barriers (World Bank, 2023).

Accordingly, the expression “comparatively lower GDP per capita” in this article refers to Armenia's position inside the selected comparison group and does not imply classification of Armenia as a low-income economy. Armenia is treated as a middle-income country; the analytical emphasis is on the gap between accumulated human potential and its economic realization.

Armenia demonstrates a relatively high Education Index (0.749 vs. average 0.728), which confirms the preservation of the educational potential inherited from the Soviet period. At the same time, the HCI (0.58) turns out to be below the average (0.62). This discrepancy indicates that the formal educational achievements of the population are not fully converted into practical competencies demanded by the modern labor market. This problem is discussed in detail in the World Bank report “Armenia Human Capital Review” World Bank. (2023): the authors record a significant gap between the academic knowledge of graduates and their ability to apply this knowledge in production conditions.

Particular concern is caused by Armenia’s position in the GII (29.0 vs. average 35.2). The lag in the innovation index by 6 points relative to the group average means that the country has not yet realized its educational and intellectual potential in the form of commercially significant innovations and technological solutions (WIPO, 2024). Low education expenditure (2.8% of GDP vs. average 3.9%), combined with insufficient linkage of educational outcomes to economic needs, forms a structural gap that must be overcome to ensure sustainable growth in labor productivity.

Armenia’s unemployment rate (13.4%) significantly exceeds the sample average (8.6%), while the employment rate (51.2%) is significantly lower than the average (56.8%). Interestingly, Armenia’s Doing Business index (74.5) is noticeably higher than the average (67.3), indicating a fairly favorable business climate. Thus, the employment problem in the country is not so much institutional (administrative-regulatory) as structural: there is a mismatch between the demand for labor from business and the professional-qualification structure of supply. The analysis of multidimensional deprivation of opportunities in the Armenian labor market (Grigoryan, A., & Khachatryan, K., 2023) confirms that barriers to employment are not random but systemic, and overcoming them requires comprehensive measures – from reforming vocational education to redistributing economic activity between regions of the country.

Dynamics of the Armenian Labor Market in 2020–2024

The analysis of the dynamics of the Armenian labor market in 2020–2024 has been carried out on the basis of data from the Statistical Committee of the Republic of Armenia (Statistical Committee of the Republic of Armenia (ARMSTAT), 2025). This period covers the recovery phase after the COVID-19 pandemic, the period of intensive influx of migrants from Russia, Ukraine, and Belarus in 2022, and the subsequent stabilization. The combination of these events has formed an extremely heterogeneous context for the development of the labor market, which complicates the unambiguous interpretation of the observed trends.

Table 3. Main indicators of the labor market of the Republic of Armenia in 2020–2024

Indicator	2020	2021	2022	2023	2024
Labor resources, thousand persons	2200,0	2227,1	2228,5	2223,2	2295,9
Labor force participation rate, %	58,5	57,8	58,8	60,3	59,1
– men	69,3	70,0	71,2	72,1	70,6
– women	49,4	47,8	48,2	50,0	49,0
– urban	58,4	56,2	56,7	58,5	57,7

– rural	58,6	60,2	62,6	63,6	61,8
Employment rate, %	47,8	48,9	50,9	52,8	51,2
– men	56,1	59,0	61,8	63,6	61,8
– women	40,9	40,5	41,5	43,4	42,0
– urban	45,4	44,8	47,1	49,7	48,4
– rural	51,5	54,9	57,6	58,4	56,5
Unemployment rate, %	18,2	15,5	13,5	12,4	13,4
– men	19,1	15,7	13,2	11,8	12,5
– women	17,2	15,2	13,8	13,2	14,4
– urban	22,3	20,3	17,0	15,1	16,1
– rural	12,1	8,8	8,0	8,0	8,6
Share of population outside labor force, %	41,5	42,2	41,2	39,7	40,9
– women	50,6	52,2	51,8	50,0	51,0

Source: Statistical Committee of the Republic of Armenia Statistical Committee of the Republic of Armenia (ARMSTAT), 2025).

As shown in Table 3, during the period under review, the number of labor resources increased from 2,200.0 to 2,295.9 thousand persons. This increase is due both to the natural increase of the working-age population and to the migration processes of 2022, when Armenia received a significant number of migrants from Russia and Ukraine (Nazaryan, G., & Vardanyan, T., 2022). Some of them have joined the Armenian labor market, creating additional demand both in the employment sphere and in the consumer services sector.

The labor force participation rate reached a maximum in 2023 (60.3%), after which it slightly decreased to 59.1% in 2024. This cycle correlates with the general economic situation: the rise of 2021–2023 was accompanied by active involvement of the population in economic activity, while the cooling of business activity in 2024 led to a partial exit of some of the labor force from the labor market. The gender gap in this indicator remains very significant: the participation rate of men is consistently around 70–72%, while for women it is only 47–50%³⁰. Such a gap is typical for many post-Soviet economies with a persisting patriarchal employment structure.

The employment rate of the population shows a steady positive dynamic – from 47.8% in 2020 to 51.2% in 2024, which means an increase of more than 3 percentage points over the five-year period. This result is very significant given the shocks the country has faced: the consequences of the pandemic, the Nagorno-Karabakh conflict of 2020, and the economic turbulence of 2022. The employment rate among men (61.8% in 2024) significantly exceeds that of women (42.0%), which confirms the structural nature of gender inequality in the Armenian labor market. The gap between urban (48.4%) and rural (56.5%) employment reflects the high share of self-employment in the agricultural sector.

Unemployment has decreased over the studied period from 18.2% to 13.4%, which in itself is a significant achievement. At the same time, in 2024 there is a slight increase (from 12.4% to 13.4%), which may indicate some slowdown in the positive trend. The gender asymmetry of unemployment has changed its configuration: while in 2020–2022 male unemployment was higher than female, by 2024 the situation had reversed – female unemployment (14.4%) exceeded male (12.5%). Urban unemployment (16.1%) is

consistently twice as high as rural (8.6%), which is associated with the concentration of youth and qualified specialists in Yerevan with limited demand for their competencies from urban employers.

Table 4. Structure of employment by type of economic activity in 2020–2024 (thousand persons)

Type of economic activity	2020	2021	2022	2023	2024	Δ, %
Total employed	1052,4	1088,3	1134,8	1174,4	1176,1	+11,8
Agriculture, forestry, fishing	229,6	237,4	250,1	225,4	206,8	-9,9
Industry	145,7	144,8	151,3	155,9	151,8	+4,2
Construction	75,1	96,0	97,2	118,4	115,7	+54,1
Trade, HoReCa	154,3	157,7	170,5	184,9	205,8	+33,4
Transport, storage, communication	74,9	75,2	90,2	96,1	95,3	+27,2
Finance, real estate, professional activities	57,4	60,3	57,5	65,8	62,3	+8,5
Public administration, education, health	264,8	269,9	265,1	267,3	270,9	+2,3
Other services	50,6	47,0	52,9	60,0	67,3	+33,0

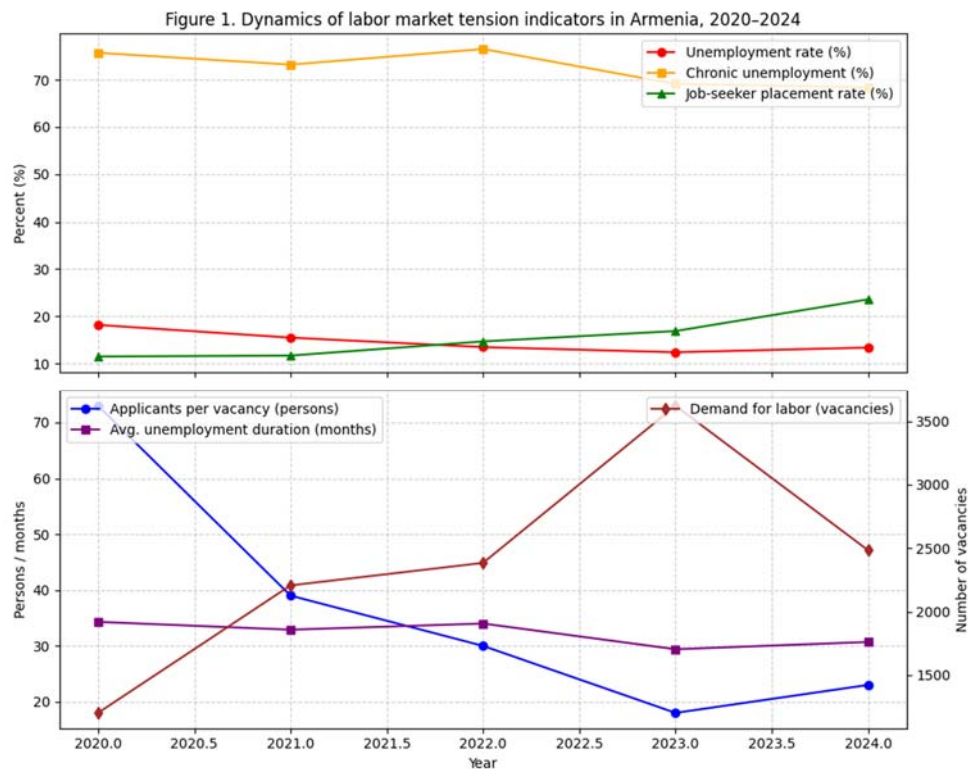
Source: Statistical Committee of the Republic of Armenia Statistical Committee of the Republic of Armenia (ARMSTAT), 2025), Δ% calculated relative to 2020.

The sectoral structure of employment has undergone a significant transformation (Table 4). The total number of employed in the economy increased from 1,052.4 to 1,176.1 thousand persons, i.e. by 11.8%. The main drivers of this growth have been trade and HoReCa (+33.4%), construction (+54.1%), transport and communication (+27.2%), and other services (+33.0%). Such significant growth in construction is partly due to the influx of foreign investment, expansion of tourist infrastructure, and housing construction – especially in Yerevan and surrounding areas. The growth in trade and services reflects both the recovery of domestic consumption and a substantial increase in tourist flows.

Agriculture has shown an unexpected decline: after a temporary increase in 2021–2022, employment in the sector fell to 206.8 thousand persons in 2024, which is 9.9% below the baseline level of 2020. This phenomenon is typical for economies undergoing structural modernization: as urban incomes grow and opportunities in the service sector expand, part of the rural population reorients to non-agricultural types of employment. Industry, which employed 145.7 thousand persons in 2020, increased slightly by 2024 (151.8 thousand), but this growth is minimal compared to the service sectors, which may indicate a limited potential for industrialization as a driver of employment in Armenia in the near future (Galstyan, A., 2025).

The public sector (public administration, education, health) remains the largest employer in the country: 270.9 thousand employed in 2024. Its share in total employment, however, has decreased slightly – from 25.2% to 23.0% – due to the faster growth of private service industries. Finance and professional services show moderate growth (from 57.4 to 62.3 thousand persons), indicating the gradual development of the business services sector. Overall, there is a steady “servicisation” of Armenian employment, characteristic of middle-income economies at the stage of transition to a post-industrial structure.

Figure 1. Dynamics of Labor Market Tension Indicators in the Republic of Armenia, 2020–2024



Source: Statistical Committee of the Republic of Armenia (Statistical Committee of the Republic of Armenia (ARMSTAT), 2025).

The applicants per vacancy – one of the most visual indicators – decreased from 73 persons in 2020 to 18 persons in 2023, but then increased slightly to 23 in 2024. This means that competition among applicants has significantly weakened, although in absolute terms it remains noticeable. For comparison, in most developed economies this indicator is 2–5 persons per vacancy, which emphasizes the persistent structural imbalance of the Armenian labor market.

The demand for labor from employers increased from 1,203 vacancies in 2020 to 3,621 in 2023, after which it decreased to 2,484 in 2024. The decrease in the last period may be associated with a cooling of business expectations, including the gradual departure of some of the companies that migrated in 2022. The job-seeker placement rate improved more than twofold: from 11.5% to 23.6% – a positive signal indicating an increase in the efficiency of labor market intermediation mechanisms (Kurginyan, R., Gasparyan, A., & Harutyunyan, A., 2025).

The most acute problem remains chronic unemployment. Despite a decrease from 75.7% to 68.4%, this indicator remains extremely high and indicates that the majority of officially registered unemployed in Armenia have been out of work for a long time. The average duration of unemployment (30.7 months in 2024) means that a typical

unemployed person spends almost 2.5 years out of employment – a period sufficient for a significant devaluation of professional competencies and atrophy of work skills. The high level of chronic unemployment is a structural phenomenon: it reflects a mismatch between the professional-qualification profile of the unemployed and the current needs of employers, as well as regional disproportions in the location of productive forces.

Psychological Dimension: An Empirical Study of Occupational Stress

The psychological dimension is an integral component of a comprehensive analysis of the labor market. Occupational stress has a direct impact on labor productivity, innovative activity, absenteeism rates, and the quality of human capital – all those factors whose deficit has been recorded in the previous sections of this work (Managhi, S., & Piao, H., 2022; Graversen, B. K., et al., 2023). Modern research convincingly shows that the economic losses from professional stress are measured not in units, but in tens of percent of GDP per capita (Burdorf, A., & Rugulies, R., 2024; Abla, E., et al., 2021). Meanwhile, the psychological dimension of the labor market in post-Soviet economies remains an understudied field.

In January-March 2026, the authors conducted an empirical study of the level of occupational stress among Armenian labor force participants (n = 234 respondents; 95% confidence level; confidence interval 6.5 percentage points) (Kulchitskaya, E. V., Hakobjanyan, A. O., Galstyan, A. R., & Kadura, E. V., 2026). The following psychodiagnostic methods were used, as described in the Methodology section: the Perceived Stress Scale PSS-10, the Fontana Professional Stress Scale, the LESS II Emotional Schemas method, the Shcherbatykh method, and a point assessment of stress based on a set of symptoms. Based on the results of standardizing the “raw” scores, a linear model for converting them into standard indicators has been constructed: $S = 11 + 1.8 \times Z_1$. The interpretation scale, justified by the standardization procedure, was as follows: low stress level - less than 14 points, moderate - 15-22 points, high - more than 22 points.

The overall coefficient of occupational stress in the surveyed Armenian labor force sample was 11 points, which corresponds to a moderate level, shifted towards low. The distribution by levels is as follows: 21% of respondents – low stress, 59% – medium, 20% – high. Thus, the majority of respondents experience tension within moderate limits, although almost every fifth person experiences pronounced chronic stress that affects the quality of their work activity. The obtained data significantly refine the picture: behind the formally moderate average values lies a significant subgroup of respondents with pronounced stress symptoms.

To respond to the methodological requirement for a clearer description of the sample, the survey recorded gender, age group, place of residence, employment status, and type of employer/job-related characteristics. These variables were used as grouping variables for the stress-level comparisons below.

Table 5. Available distribution of stress levels by respondent characteristics.

Respondent characteristic	Low stress	Moderate stress	High stress	Interpretation
Total sample (n = 234)	21%	59%	20%	Overall distribution of the integrated stress indicator
Women (n = 130)	Detailed cross-tabulation	60%	Detailed cross-tabulation	Moderate stress is the dominant category

	retained in survey database		retained in survey database	
Men (n = 104)	Detailed cross-tabulation retained in survey database	60%	Detailed cross-tabulation retained in survey database	Moderate stress is the dominant category
Rural respondents	Detailed cross-tabulation retained in survey database	58%	Detailed cross-tabulation retained in survey database	Moderate stress is the dominant category
Urban respondents	Detailed cross-tabulation retained in survey database	64%	Detailed cross-tabulation retained in survey database	Moderate stress is the dominant category
Employed respondents	Low stress is more common than among unemployed respondents	Dominant category	Lower than among unemployed respondents	Employment status is associated with stress profile
Unemployed/job-seeking respondents	Detailed cross-tabulation retained in survey database	Dominant category	22%	High stress is more frequent than among employed respondents
Private-sector employees	24% with low stress	Detailed cross-tabulation retained in survey database	Detailed cross-tabulation retained in survey database	Higher stress risk than public sector
Public-sector employees	35% with low stress	Detailed cross-tabulation retained in survey database	Detailed cross-tabulation retained in survey database	Lower stress risk than private sector

Source: Developed by authors.

Gender analysis has not revealed statistically significant differences: 60% of women (out of 130 in the sample) and 60% of men (out of 104) demonstrate an average level of stress. This noticeably diverges from the results obtained in most Western European studies, where women typically show higher levels of perceived stress (Managhi, S., & Piao, H., 2022). Possible explanations are related to the specifics of the sample and socio-cultural characteristics: in Armenia, restraint in the manifestation of psychological discomfort is traditionally encouraged in both sexes, which may underestimate self-assessments of stress regardless of the actual state.

No statistically significant differences have been found by type of locality: 58% of rural residents and 64% of urban residents experience an average level of stress. At the same time, significant differences have been found by employment status: among employed respondents, moderate-to-low stress categories prevail, while among the unemployed/job-seeking respondents, a high level of stress was recorded in 22%, which is higher than among employed respondents. This corresponds to international research data indicating that unemployment is a powerful psychological stressor, exceeding many other life events in terms of negative impact (Graversen, B. K., et al., 2023; Morrisey, M., et al., 2021).

Significant differences have been found depending on the type of employer: employees of private companies demonstrate higher stress compared to public-sector

employees: low stress was recorded among 24% of private-sector employees and 35% of public-sector employees. This result is of considerable interest: it points to more stressful working conditions in the private sector – greater uncertainty, job instability, higher productivity requirements. The age breakdown reveals that the most favorable psychological profile is characteristic of persons under 20 years old (40% with low stress) and 51–60 years old (53% with low stress), while people aged 20–50 are dominated by an average level – the period of greatest work load and career responsibility.

The psychodiagnostic data reveal a substantive picture of behavioral patterns in stressful situations. Of all surveyed workers, 55% try to avoid strong emotions, 61% consider strong emotions dangerous, 22% believe that emotions are better suppressed, and 18% regard them as a sign of weakness. Thirty-four percent of respondents avoid emotional conversations. These indicators form a portrait of a culture of emotional suppression, characteristic of a number of post-Soviet societies and increasing the latent stressogenicity of the work environment. Importantly, 76% of surveyed workers think about work problems in their free time – a classic sign of chronic occupational stress leading to professional burnout (Abla, E., et al., 2021).

The symptomatology of stress also deserves detailed consideration. Fatigue without apparent reasons was noted by 66% of respondents, anxiety – 66%, sleep and appetite disturbances during stressful periods – 59%, headaches – 55%, irritability – 54%, reduced work capacity – 50%. The combination of these symptoms indicates that occupational stress in the surveyed Armenian labor force sample has multidimensional manifestations and affects a majority of respondents to some extent. The irritability indicator carries a particular social burden: 64% of respondents reported that they easily lose their temper over minor issues, which inevitably affects the quality of interpersonal interaction in the work collective.

The analysis of openness of communication in the professional environment has revealed a very limited level of psychological safety. Only 3% of respondents believe they can be frank with their supervisor; with colleagues – 12%; with family members – 33%. Such a low level of trust in the work environment indicates that surveyed the surveyed Armenian workers tend to cope with stress alone, without resorting to constructive social support. This may increase psychological pressure on the individual and reduce the likelihood of timely identification and resolution of organizational problems. It should also be noted that 77% of respondents react to criticism addressed to them “moderately”, which, in the context of other data, is interpreted as a sign of reduced tolerance to criticism and potential conflict – hidden, not manifesting itself in open clashes.

The most important conclusion of the study is that occupational stress observed in the sample is more often chronic and latent than acute. It is not expressed in high conflict or open destructive manifestations – 85% of surveyed workers have no unresolved conflicts with colleagues. However, it is manifested among respondents in fatigue, anxiety, avoidance of emotions, and low readiness for open communication – i.e., in those psychological states that gradually undermine labor potential, reducing initiative, creative thinking, and innovative activity (Kulchitskaya, E. V., Hakobjanyan, A. O., Galstyan, A. R., & Kadura, E. V., 2026). Overcoming this “silent” stress requires not

point interventions, but systematic work with organizational culture and professional psychological support.

The study has several limitations. The empirical survey is based on $n = 234$ respondents; at a 95% confidence level this corresponds to a confidence interval of approximately 6.5 percentage points. Therefore, the results should be interpreted as stable sample-based tendencies rather than as exact estimates for the entire national workforce. In addition, cross-country comparisons are constrained by differences in statistical methodologies across countries.

Thus, the psychological results are used in this article as evidence of trends observed in the sample and as a basis for hypotheses about labor-potential realization. They are not interpreted as a direct measurement of the psychological condition of the entire Armenian workforce, and causal links with national innovation performance should be tested in future studies using larger representative samples and regression/correlation models.

Conclusion

The conducted research allows us to formulate a number of fundamental conclusions that integrate the three analytical dimensions – macroeconomic, labor market, and psychological. The central thesis that unites all three sections is the following: Armenia has significant but insufficiently realized human potential, and the gap between this potential and economic results has a multi-level nature and is reproduced at each of the studied levels of analysis.

At the macroeconomic level, the correlation analysis of 20 countries demonstrates that Armenia occupies a specific position among middle-income economies: a relatively high HDI (0.811) combined with comparatively lower GDP per capita (USD 8,501) within the selected sample, a good Education Index (0.749) with a not-so-high Human Capital Index (0.58), a relatively favorable business climate with a noticeable lag in the Global Innovation Index (29.0 vs. average 35.2). This configuration is typical for economies in a “middle-income trap”: human potential has been accumulated, but the mechanisms for its transformation into economic productivity and technological innovation remain insufficiently developed (Diebolt, C., & Hippe, R., 2018; Shi, S., & Wang, S., 2024).

At the labor market level, undeniable progress has been recorded over the five-year period: unemployment has decreased from 18.2% to 13.4%, employment has increased by 3.4 percentage points, the applicants per vacancy have decreased from 73 to 23 persons. At the same time, structural problems persist: the gender gap in employment (about 20 p.p.) remains one of the most acute in the region; the share of chronic unemployment (68.4%) indicates an accumulated structural mismatch between professional competencies and market needs; the “servicisation” of employment without a simultaneous increase in labor productivity creates the risk of replacing quality employment with low-productivity jobs (Tiratsvyan, A., 2025; Kurginyan, R., Gasparyan, A., & Harutyunyan, A., 2025).

At the psychological level, the empirical study has revealed latent stress tendencies within the surveyed group; these tendencies do not necessarily manifest themselves in open conflicts, but may reduce labor potential at the level of the sample. The culture of emotional suppression, low psychological safety in the workplace, and the observed

share of respondents reporting difficulty in “switching off” from work problems during non-working hours indicate potential chronic tension that may constrain sustainable innovative development, rather than proving a direct national-level causal relationship (Kulchitskaya, E. V., Hakobjanyan, A. O., Galstyan, A. R., & Kadura, E. V., 2026). This conclusion organically complements the picture drawn by the previous sections: The findings therefore suggest that psychological working conditions should be considered as one possible component of Armenia’s innovation and productivity challenges, alongside economic, educational, and institutional factors.

Based on the results obtained, the following directions for state policy can be proposed. In the field of education and human capital, the priority should be not increasing expenditures, but increasing their effectiveness – with an emphasis on practice-oriented programs demanded by the labor market. In the field of employment, targeted measures are needed to reduce the gender gap, stimulate women’s employment, and combat chronic unemployment through retraining programs and active job placement assistance. In the field of psychological health protection, it is important to institutionalize psychological support in the workplace, form a culture of open communication, and consider occupational stress management as an investment in labor productivity, not as a social expense (Managhi, S., & Piao, H., 2022; Burdorf, A., & Rugulies, R., 2024). The integration of all three directions into a unified employment and human development policy will allow Armenia to fully realize its accumulated potential and move to a higher trajectory of economic growth.

Thus, unlocking Armenia’s development potential requires not only economic and institutional reforms, but also a reconsideration of the human and psychological dimensions of labor as key drivers of sustainable growth.

Appendix A. Survey Questionnaire Structure

The questionnaire used in the empirical study included seven blocks. The full instrument was administered online; the structure below is provided to clarify the content and logic of sample formation and stress measurement.

Block 1. Socio-demographic information: gender, age group, place of residence, education, and other basic characteristics necessary for describing the respondent profile.

Block 2. Employment characteristics: current employment status, type of employer or employment, sphere of activity, and job-related characteristics used for subgroup comparison.

Block 3. Perceived Stress Scale (PSS-10): ten items evaluating how often the respondent experienced stress-related feelings during the previous month; answers were recorded on a five-point Likert scale from 0 (“never”) to 4 (“very often”).

Block 4. LESS II Emotional Schemas method: statements assessing beliefs about emotions, emotional control, suppression, and avoidance; answers were recorded on an agreement scale.

Block 5. Shcherbatykh stress-diagnosis method: a list of psychological, physiological, and behavioral symptoms of stress with “yes/no” answers.

Block 6. Fontana Professional Stress Scale: items measuring work-related exhaustion, internal tension, irritability, anxiety, sleep disturbance, reduced productivity, and related symptoms; answers ranged from 0 (“never”) to 3 (“almost always”).

Block 7. Point assessment of stress symptoms: ten questions characterizing the severity of basic stress symptoms such as sleep disturbance, irritability, headaches, and fatigue, assessed from 0 to 3 points.

The integrated stress score was calculated after standardization of raw scores obtained from the psychodiagnostic blocks. The final interpretation was: low stress below 14 points, moderate stress from 15 to 22 points, and high stress above 22 points.

References

- Abla, E., et al. (2021). *Workplace stress and productivity: A cross sectional study*. *Kansas Journal of Medicine*.
- Burdorf, A., & Rugulies, R. (2024). *Economic consequences of adverse working environments*. *Scandinavian Journal of Work, Environment & Health*, 50(2), 49–52.
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). *A global measure of perceived stress*. *Journal of Health and Social Behavior*, 24(4), 385–396.
- Diebolt, C., & Hippe, R. (2018). *The long run impact of human capital on innovation and economic development in European regions*. *Applied Economics*.
- Fontana, D. (1989). *Managing Stress*. Leicester: British Psychological Society.
- Galstyan, A. R. (2025). *Trends in labor market development in the Republic of Armenia*. *Bulletin of Yerevan State University. Economics*, 16(1), 48–62.
- Graversen, B. K., et al. (2023). *Labor market costs of occupational stress*. *Scandinavian Journal of Work, Environment & Health*.
- Grigoryan, A., & Khachatryan, K. (2023). *Multidimensional deprivation of opportunities in the labor market in Armenia*. *Journal of International Development*.
- International Labour Organization. (2013). *Resolution concerning statistics of work, employment and labour underutilization*.
- Kulchitskaya, E. V., Hakobjanyan, A. O., Galstyan, A. R., & Kadura, E. V. (2026). *Study of occupational stress among the economically active population of the Republic of Armenia*. Saint Petersburg–Yerevan: SPbSU & YSU.
- Kurginyan, R., Gasparyan, A., & Harutyunyan, A. (2025). *Dynamics of the labor market and unemployment in the Republic of Armenia*. *SHSU Scientific Proceedings*.
- Leahy, R. L. (2015). *Emotional Schema Therapy*. New York: Guilford Press.
- López Pueyo, C., Jiménez, G., & Sanau, J. (2014). *Measuring human capital in OECD countries and its relationship with economic growth and innovation*. *Revista de Economía Mundial*.
- Managhi, S., & Piao, H. (2022). *Assessment of occupational stress among employees by determining human capital losses in Japan*. *BMC Public Health*, 22(1).
- Morrisey, M., et al. (2021). *The impact of occupational heat stress on worker productivity and economic costs*. *American Journal of Industrial Medicine*.
- Nazaryan, G., & Vardanyan, T. (2022). *Labor migration processes and institutional frameworks for their regulation in the EAEU countries*. *Alternative*.
- Ngo, H. P. T. (2023). *Human capital for developing innovative potential in middle income countries*. *International Journal of Economics and Finance*, 15(11).
- Shi, S., & Wang, S. (2024). *Assessing the impact of human capital in the process of industrial structure modernization*. *PLoS ONE*, 19(7).
- Shcherbatykh, Y. V. (2006). *Psychology of Stress and Methods of Correction*. Saint Petersburg: Piter.
- Statistical Committee of the Republic of Armenia (ARMSTAT). (2025). *Labor market in the Republic of Armenia, 2020–2024*. Yerevan. <https://www.armstat.am>
- Tiratsvyan, A. (2025). *Problems of labor market development and the need for a remote work promotion policy in the RA*. Armenian Research and Education Resource Archive.
- UNDP. (2024). *Human Development Report 2024*. New York: United Nations. <https://hdr.undp.org>
- WIPO. (2024). *Global Innovation Index 2024*. Geneva: WIPO. https://www.wipo.int/global_innovation_index/en/2024/
- World Bank. (2023). *Armenia Human Capital Review*. Washington, DC: World Bank Group.
- World Bank. (2024). *World Bank Country and Lending Groups*.
- World Bank. (2024). *World Development Indicators 2024*. Washington, DC: World Bank. <https://databank.worldbank.org/source/world-development-indicators>

THEORETICAL AND APPLIED PROBLEMS OF TAX BURDEN DISTRIBUTION IN THE CONTEXT OF CONSUMPTION, CAPITAL, AND LABOUR TAXATION

GEVORG KIRAKOSYAN* 
Yerevan State University

MIKAYEL BARSEGHYAN** 
M. Kotanyan Institute of Economics

Abstract: The purpose of this article is to examine the theoretical foundations of the distribution of the tax burden and to assess the specific features of its manifestation in modern tax systems, with a particular focus on the Republic of Armenia. The article presents the essence of taxing consumption, capital, and labor, their advantages and disadvantages, economic effects, as well as contemporary economic approaches to these fundamental issues. An empirical analysis has been conducted to assess the qualitative impact of consumption, capital, and labor taxation on economic growth in the Republic of Armenia. As a result of the study, pathways are proposed for a more proportionate distribution of the tax burden in the Republic of Armenia that would contribute to achieving an optimal balance between economic growth and social justice.

Key words: *tax burden, consumption taxation, labour taxation, capital taxation, tax policy, tax system*

Introduction

The tax system is one of the most important instruments of socio-economic policy, through which the state generates public revenues and regulates economic processes. The effectiveness of the tax system, among other factors, is largely determined by the structure of the distribution of the tax burden.

In general, the fundamental issues of tax burden distribution in economic theory are discussed along three main directions:

- consumption taxation,
- capital taxation,
- labour taxation (Johansson A., Heady C., Arnold J., Brys B., Vartia L. 2008. pp. 11-14, 18-21, Stiglitz J. E., Rosengard J. K. 2015. pp. 482-485).

These three elements form the structural foundation of modern tax systems, with their relative proportions varying across countries depending on the level of economic

* **Gevorg Kirakosyan** – PhD in Economics, Associate Professor at the YSU Chair of Finance and Accounting
E-mail: g.kirakosyan@ysu.am ORCID ID: <https://orcid.org/0009-0000-7558-0474>

** **Mikayel Barseghyan** – PhD Student, M. Kotanyan Institute of Economics

E-mail: barseghyan.mikayel2002@gmail.com ORCID ID: <https://orcid.org/0009-0002-5206-7648>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 25.03.2026

Revised: 06.04.2026

Accepted: 19.06.2026

© The Author(s) 2026

development, the social conditions of the population, and the efficiency of tax administration.

In general, the issue of tax burden distribution is important not only for the formation of public revenues but also from the perspective of ensuring economic efficiency and social equity. It is no coincidence that one of the key challenges facing modern tax systems is determining which sector of the economy should bear the primary tax pressure — consumption, capital, or labour. The problem lies in the fact that taxing each of these has distinct effects on economic growth, investment, work incentives, and social inequality. Therefore, assessing the effectiveness of a tax system requires examining the relative shares of these three taxation objects within the structure of tax revenues. Moreover, this issue is of not only practical but also scientific importance, since the effectiveness of the tax system largely depends on the approaches underlying it, including the establishment of a scientifically grounded balance between the taxation of consumption, capital, and labor.

Theoretical and methodological foundations of the study and methods of analysis

Various schools of economic thought propose different approaches, based on the objectives of economic efficiency, social justice, and ensuring economic growth. Representatives of the classical school — Adam Smith, David Ricardo, and John Stuart Mill — placed the principles of tax fairness and economic neutrality at the foundation of tax policy (Smith A. 2007. pp. 825–827, Ricardo D. 2004. pp. 133-139, Mill J. S. 2005. pp. 804-809). Followers of welfare economics argue that the tax system should simultaneously ensure economic efficiency and social justice (**Stiglitz J. E., Rosengard J. K. 2015. pp. 456**). Meanwhile, proponents of optimal taxation theory, such as F. Ramsey and J. Mirrlees, believe that taxes should be designed in a way that minimizes losses in economic efficiency. According to this approach, it is more appropriate to tax those objects whose impact on the behavior of economic agents is relatively small (Ramsey F. P. 2013. pp. 47-48, Mirrlees J. A. 1971. pp. 175).

To address the research objectives, the study employs the following methods: economic-statistical analysis, systemic analysis, comparative analysis, and factor analysis. The analysis draws on data from the websites of the Statistical Committee of the Republic of Armenia, the Government of the Republic of Armenia, and the State Revenue Committee of the Republic of Armenia.

Analysis

The key importance of the tax system for each state, first of all, is manifested in the fact that it allows not only to generate the revenues necessary to meet state and public needs, but also, if necessary, to have an appropriate impact on economic processes and relations, acting as a unique instrument of state regulation of the economy. At the same time, it should be taken into account that the principles and mechanisms underlying the tax system can lead to exactly the opposite effect, limiting opportunities for economic and business development, contributing to a deepening polarization of income and property of the population, the expansion of shadow activities and hidden employment, and the manifestation of a number of other undesirable phenomena from the perspective of economic development. That is, the importance and significance of the tax system, so

to speak, are twofold. In other words, the importance and significance of the tax system, so to speak, are twofold. This can contribute both to the proper performance of State functions, an increase in the volume of public goods and the formation of incentives for economic activity, as well as to the emergence of obstacles and restrictions in economic development. Therefore, the tax system should be based on scientifically sound and proven approaches that will be effective in practice, based on the socio-economic characteristics of a given country and will correspond to the opportunities for economic development and the priorities and preferences proclaimed by the state. At the same time, the solution to these problems is largely determined by the principles and conceptual approaches underlying the tax system, the justification of which, first of all, should be based on the socio-economic characteristics of a given country. In this regard, at the stage of forming the tax system, such fundamentally important issues as the level of the tax burden and the ratio of direct and indirect taxes should be clarified. In fact, the normal functioning of the tax system and, most importantly, its effective functioning as a tool for generating government revenues and influencing economic processes depends on this. At the same time, the level of the tax burden and the structure of its distribution are determined by various objective and subjective factors, and from this point of view, the state's capabilities are significantly limited by such conditions as the tax potential of the economy, priorities and priorities of socio-economic development, the tax culture of society, etc.

In essence, the nature and socio-economic content of the tax system are manifested through the functions it performs, regarding which various opinions exist in professional literature. Broadly speaking, the tax system is characterized by the functions carried out by the taxes themselves. A number of authors attribute solely a fiscal function to the tax system, whereas others attribute additional functions to it.

There is a viewpoint that the functions of the tax system are identical to the functions of taxes. However, not all functions of the tax system can be performed by every type of tax. The primary significance of any tax system lies in the implementation of its fiscal function. All other functions are performed by the system as a result of the interaction between its constituent components.

The fulfillment of the fiscal function leads to distributive, stimulative, and regulatory actions, given that all components of the financial system are interconnected. The payment of taxes cannot occur without accounting and control; thus, the supervisory function of the tax system is realized.

As a result of the functioning of the tax system, relations arise between various subjects, which represent relations regulated by legal norms aimed at the formation of a certain portion of budgetary revenues. These relations are characterized by a power-based nature, which implies an inequality of the parties. On one side stands the state, endowed with the jurisdiction to make imperative decisions, and on the other side are the taxpayers, who are obliged to act within the framework of established laws and imperative norms. Furthermore, the interests of the parties involved in tax legal relations are different and conflicting, which in many cases causes various socio-economic conflicts, consequently impacting the economy. The state must evaluate the expenditure needs of the country and society, as well as the capacities of the economy, and based on this, define the types of taxes and the level of the tax burden.

It is obvious that the government always strives to collect the maximum volume of taxes, which allows for the formation of a stable financial base necessary for the implementation of its own functions, thereby expanding the possibilities to execute large-scale and diverse expenditure programs. Moreover, the vast majority of these programs are directed toward ensuring the welfare of society (including the taxpayers themselves). However, the collection of maximum taxes should not become an ultimate goal without considering the potential development capabilities of the economy. It is evident that the development of the national economy implies and requires the formation of appropriate prerequisites, the elimination of obstacles and restrictions on economic activity, and, ultimately, a tax environment that will enable expanded reproduction through operating within the legal field. Therefore, the tax system must ensure the harmony of interests between the state and taxpayers in order to achieve the goals of both the state (forming a financial base for the normal vital activity and development of the state) and society (welfare growth, decent living conditions, and a favorable environment for economic activity).

In modern conditions of the development of economic relations, international integration cooperation, and the deepening of globalization processes, national economies undergo profound structural changes. In such a situation, the significance of state regulation of the economy and the justified intervention of the state in economic processes obviously increases substantially. At the same time, regulation tools and methods must undergo appropriate transformations, driven by the new economic environment and its concomitant challenges. In this regard, the tax system, which is one of the crucial instruments of state economic regulation, must also undergo certain changes in order to possess the necessary capacities to achieve its primary goals. Otherwise, serious risks will arise regarding the formation of budgetary revenues and, consequently, the underfunding of public expenditures. Therefore, the formation of an efficient and equitable tax system constitutes one of the vital prerequisites for the normal vital activity of the state and society. Furthermore, a key attribute of such a system must be the well-founded harmonization of the interests and concerns of the participants in tax relations. However, the normal functioning of the tax system is disrupted, and the achievement of the set goals is jeopardized when a conflict arises between the interests of the parties involved in tax relations. As a rule, this can occur for various reasons. One of the main causes is the violation of the fundamental principles underlying the tax system: equity and efficiency. By the former, one should understand the proportionality of taxpayers' participation in the process of forming state revenues, conditioned by their financial capacities, whereas the latter refers to a positive difference between the collected funds and the incurred costs throughout the entire taxation process—from tax accounting to tax collection. Moreover, taxation must apply equally to everyone, and the application of differentiated approaches should be implemented based on specific criteria that correspond to the conceptions and perceptions of justice in a given society and at a given stage of development.

The phenomena and crisis manifestations recorded in the global economy over recent decades have once again substantiated the necessity of strengthening state regulation of the economy. In such a situation, the concentration of a certain portion of the gross domestic product within the budgetary system through tax instruments emerges as a vital means of the state's targeted influence on economic and social processes, thereby

contributing to the creation of the financial foundations for the proper implementation of state functions. The tax system acquires particular importance not only in forming the prerequisites necessary for the normal functioning of the economy but also in the process of satisfying the expenditure needs of society and the state.

In general, the distribution of the tax burden is examined across three main objects: consumption, capital, and labour. Economic studies indicate that different types of taxes have varying impacts on economic growth. Research by the OECD has shown that consumption taxes have the least negative effect on economic growth, while corporate income taxes exert the most significant adverse impact (**Johansson A., Heady C., Arnold J., Brys B., Vartia L. 2008.** pp. 11-14).

1. **Consumption taxes** are indirect taxes applied to the consumption of goods and services. Their main types include value-added tax (VAT), excise taxes, and sales taxes.

The concept of consumption taxation has been widely developed within neoclassical theory, which posits that taxes should have minimal influence on economic decision-making. Economist Irving Fisher argued that taxing consumption rather than income could stimulate savings and investment. According to him, long-term economic growth depends on the level of investment and savings, and consumption taxation does not reduce these incentives (**Fisher I. 2013. pp. 30–33**). Nicholas Kaldor, who developed the theory of expenditure taxation, believed that consumption taxation is more equitable because it targets the use of income rather than its acquisition (**Kaldor N. 1955. pp. 15-18**). He proposed replacing personal income taxation with expenditure taxation.

The main advantages of consumption taxes include:

- Promotion of economic efficiency: Consumption taxes have a relatively small impact on capital accumulation, contributing to long-term economic growth. This approach underlies the consumption-based tax system proposed by Robert Hall and Alvin Rabushka (**Hall R. E., Rabushka A. 2007. pp. 12-18**).
- Stimulation of investment: When consumption rather than income is taxed, economic agents are more inclined to save and invest.
- Simplicity of tax administration: Consumption taxes often feature simpler accounting mechanisms and comparatively fewer opportunities for tax evasion compared to profit taxation.
- Broad tax base: Consumption taxes cover a significant portion of the economy, ensuring stable revenues for the state budget.

At the same time, consumption taxes are often regressive, as low-income households allocate a larger share of their income to consumption. Consequently, they can exacerbate social inequality. Additionally, there is a high risk of inflation, which can negatively affect the social conditions of the population.

2. **Capital or business taxation**, primarily implemented through corporate income tax, is viewed in economics as an important tool for generating public revenues and ensuring social justice. Business taxation is justified in economic theory for several key reasons. First, it serves as a mechanism for income redistribution. Economist Joseph Stiglitz notes that business activity heavily depends on the institutional and economic environment created by the state. Therefore, taxing profits is fair, as it finances these public goods (**Stiglitz J. E., Rosengard J. K. 2015. pp. 18-20**). Experts highlight the following advantages of capital taxation:

- Income redistribution: Business profits are often concentrated among high-income individuals, so taxing them helps reduce income inequality.
- Financing public goods: Businesses benefit from state-provided infrastructure, legal systems, and markets, so it is fair for them to contribute to their funding.

However, capital or business taxation can reduce investment activity, encourage capital flight, and increase opportunities for tax avoidance. These issues have become particularly relevant in the context of globalization, as capital can easily move to countries with lower tax burdens.

3. **Labour taxation** refers to the taxation of individuals' income, primarily through personal income tax and social contributions. Labour taxation is a key source of state budget revenue and a tool of social policy. At the same time, it plays an important role in income redistribution. However, an excessively high tax burden can reduce labour supply and encourage shadow employment. In public finance theory, labour taxation is often seen as a means of ensuring social justice. The optimal taxation theory developed by James Mirrlees shows that the tax system must balance efficiency and equity (**Mirrlees J., Adam S., Besley T., et al. 2011. pp. 39-42**).

According to OECD research (Revenue Statistics 2025, OECD), capital taxes have the most negative impact on economic growth, labour taxes have a negative effect, consumption taxes are less harmful, and property taxes have the least adverse impact. In particular, in the most efficient structure, the optimal range for consumption taxation is considered 40–45%, for labour taxation 25–30%, and for capital taxation 15–20%.

As observed, each type of taxation is intended to address specific issues. It is no coincidence that modern economies commonly adopt a combined approach, where the tax system includes consumption, capital, and labour taxes in certain proportions, striving to simultaneously ensure economic efficiency, social justice, and tax revenue stability.

In 2016, the Tax Code of the Republic of Armenia was adopted, one of the foundational principles of which was “prioritizing long-term economic growth without focusing on short-term results.” As a practical implementation of this principle and a means to enhance the competitiveness and investment attractiveness of the national economy, it was declared necessary to place the main emphasis on consumption taxation, while establishing the lowest possible tax burden on the incomes of economic entities and individuals. The expected outcomes included attracting foreign direct investment, modernizing and re-equipping the national economy, promoting exports, increasing the competitiveness of the national economy at least within the region and the Eurasian Economic Union, and ensuring long-term and sustainable economic growth (Justification of the draft Tax Code of the Republic of Armenia).

In the tax system of the Republic of Armenia, from the perspective of consumption, capital, and labour taxation, the following types of taxes are distinguished respectively: value-added tax and excise tax, corporate income tax, and income tax. The following dynamics were recorded for these taxes over the period 2015–2024.

Over the period 2015–2024, tax revenues in absolute terms have generally increased — from 1,067.9 billion drams to 2,390.9 billion drams, or approximately 2.2 times. The only exception was 2020, when a decline was recorded from 1,464.3 billion drams to 1,385.2 billion drams, due to the pandemic and military-political situation.

Table 1. Consumption, capital and labor taxation in Armenia, 2015-2024
(billion drams)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Tax revenues	1067.9	1079.7	1158.0	1258.1	1464.3	1385.2	1586.9	1926.0	2221.9	2390.9
Consumption taxation	473.9	450.8	488.9	547.2	676.6	595.2	669.1	807.1	916.6	902.4
Percentage share in tax revenues (%)	44.4	41.7	42.2	43.5	46.2	43.0	42.2	41.9	41.2	37.7
VAT	423.9	391.1	406.6	438.2	506.5	471.6	556.0	679.6	767.2	755.9
Excise tax	50.0	59.7	82.3	109.0	170.1	123.6	113.1	127.5	149.4	146.5
Capital taxation Corporate income tax	103.6	127.2	109.8	170.1	233.8	148.8	158.6	222.8	321.5	335.7
Percentage share in tax revenues (%)	9,7	11,8	9,5	13,5	16,0	10,7	11,4	11,6	14,5	14,0
Labor taxation personal income tax	311.7	332.7	341.5	356.6	440.8	411.5	426.3	474.8	554.5	650.1
Percentage share in tax revenues (%)	29,2	30,8	29,5	28,3	30,1	29,7	26,9	24,6	24,9	27,2

Source. Statistical Yearbook of Armenia, 2025, Statistical Yearbook of Armenia, 2020.

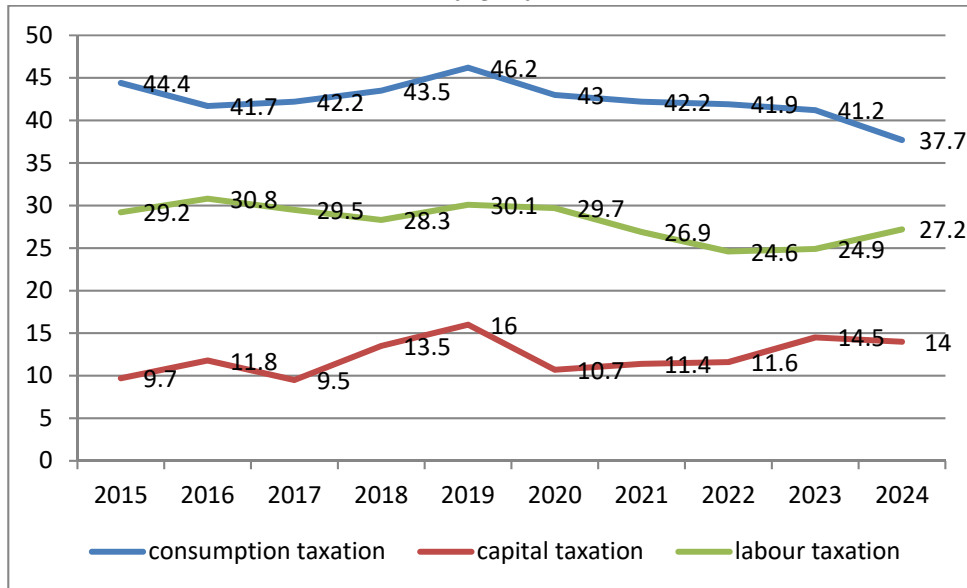
The data in Table 1 show that consumption taxation (VAT + excise tax) remained the largest component of tax revenues throughout the entire period, growing by about 1.9 times between 2015 and 2024. Although the total volume of consumption taxation increased in absolute terms, its share in total tax revenues decreased — from 44.4% in 2015 to 37.7% in 2024.

Corporate income tax grew almost 3.2 times over the observed period — from 103.6 billion drams in 2015 to 335.7 billion drams in 2024. Its relative share in tax revenues increased from 9.7% in 2015 to 14.0% in 2024. It should also be noted that in 2020 the corporate income tax rate was reduced from 20% to 18%, which also affected inflows from this type of tax. In other words, capital taxation in Armenia is a relatively more volatile component, yet one that has gained growing importance in the long term.

Income tax also recorded steady growth over 2015–2024 — approximately 2.1 times. However, its share in the structure of tax revenues showed some fluctuation — decreasing from 29.2% in 2015 to 27.2% in 2024. In essence, labour taxation has maintained high importance in the long run, although its proportion decreased in certain periods, particularly in 2021–2023, when the growth of corporate income tax was faster.

Overall, during the observed period, the relative shares of consumption, capital and labour taxes in total tax revenues exhibited the following dynamics.

Figure 1. Shares of consumption, capital, and labour taxes in total tax revenues, 2015–2024



Source. Statistical Yearbook of Armenia, 2025, Statistical Yearbook of Armenia, 2020.

Thus, it can be concluded that throughout the entire period, consumption taxation has remained the primary component, labour taxation the second largest, and capital taxation a relatively smaller but rapidly growing component. At the same time, despite its dominant role, the relative importance of consumption taxation is declining, while capital taxation demonstrates the highest relative growth, which may indicate the activation of profitable sectors of the economy or improvements in tax administration. Labour taxation continues to maintain its position as a stable second component, although its share does not exhibit the same rapid growth as capital taxation. Overall, during 2015–2024, a slow shift is observed in the structure of the tax burden in the Republic of Armenia—from consumption toward income- and profit-generating bases. In other words, despite the objectives set out in the Tax Code, the actual dynamics of structural changes in tax revenues differ in practice. Undoubtedly, it is necessary to take into account those objective factors, the influence of which was also significant on the formation of the ratio of taxes on consumption, capital and labor in the republic during the period under review. Among the mentioned factors, one can especially highlight macroeconomic development, economic realities and constraints, the tax potential of the economy, etc.

Conclusion

The issue of tax burden distribution is one of the central questions of modern tax policy. Economic theory widely accepts the approach according to which the tax system should be built on three main tax bases—consumption, labour, and capital—taking into account the advantages and disadvantages of each. Therefore, a combined approach is most appropriate for modern tax systems, allowing the simultaneous achievement of economic efficiency and social balance.

The analysis of the structure of tax revenues in the Republic of Armenia shows that during 2015–2024 the share of consumption taxes exhibits a downward trend, driven by

low social security, inflationary effects, and the risk of consumption constraints. The role of capital taxation is increasing, due to reforms implemented in corporate income tax, growth in economic activity, and rising corporate profits. The share of labour taxation is declining, mainly due to the flattening of personal income tax rates.

To improve the effectiveness of the tax system in the Republic of Armenia, it is necessary to implement a combined tax policy, the foundation of which should be the relative dominance of consumption taxes, the social orientation of labour taxation, and the competitiveness of capital taxation. Such an approach would make it possible to ensure economic growth, increased investment activity, and strengthened social justice. It is necessary to maintain the formed structure between consumption, capital, and labour taxation, with a partial shift of the tax burden from labour taxation toward consumption taxation. As options for solving this problem, one can consider reducing the VAT rate on basic necessities while simultaneously narrowing the scope of non-social tax privileges established for this type of tax. As a solution to this problem, we can consider reducing the VAT rate on essential goods while reducing the range of non-social tax benefits established for this type of tax, which will reduce the regressiveness of consumption taxes to a certain extent. At the same time, to neutralize possible budgetary losses from income tax, it is necessary to introduce a progressive tax scale, thereby preserving not only the economic but also the social significance of this tax type. In other words, emphasis should be placed on consumption taxes to ensure economic efficiency, and on taxes levied on labour and capital to ensure social justice.

References

- Justification of the draft Tax Code of the Republic of Armenia
<http://www.parliament.am/drafts.php?sel=showdraft&DraftID=8116&Reading=0>
- Statistical Yearbook of Armenia, 2025, Statistical Committee Republic of Armenia
<https://www.armstat.am/am/?nid=586&year=2025>
- Statistical Yearbook of Armenia, 2020, Statistical Committee Republic of Armenia
<https://www.armstat.am/am/?nid=586&year=2020>
- Auerbach A., Hines J. Taxation and Economic Efficiency. In: *Handbook of Public Economics*, 2002. Vol. 3. Amsterdam: Elsevier.
- Fisher I. *The theory of interest*. New York: Macmillan. Cosimo Classics (reprint). 2013.
- Hall R. E., Rabushka A. *The flat tax*. Revised and updated edition. Stanford: Hoover Institution Press. 2007.
- Johansson A., Heady C., Arnold J., Brys B., Vartia L. *Taxation and Economic Growth*. OECD Economics Department. Working Paper No. 620. 2008. Paris: OECD Publishing.
- Stiglitz J. E., Rosengard J. K. *Economics of the Public Sector*, 4th ed. New York: W.W. Norton. 2015.
- Smith A. *An inquiry into the nature and causes of the wealth of nations*. MetaLibri Digital Library. 2007. (Book V, Chapter II – Of Taxes)
- Ramsey F. P. *A contribution to the theory of taxation*. In: *The foundations of mathematics and other logical essays*. London: Routledge (reprint edition). (2013).
- Ricardo D. *On the principles of political economy and taxation*. Mineola, NY: Dover Publications. 2004.
- Mill J. S. *Principles of political economy*. Oxford: Oxford University Press (Oxford World's Classics edition). 2005.
- Mirrlees J. A. An exploration in the theory of optimum income taxation. *Review of economic studies*, 1971. Vol. 38, No. 2.
- Mirrlees J., Adam S., Besley T., et al. *Tax by design: The Mirrlees Review*. Oxford: Oxford University Press. 2011.
- Kaldor N. *An expenditure tax*. London: George Allen & Unwin. 1955.
- Revenue Statistics 2025: The OECD Tax Database. OECD Publishing. www.oecd.org/tax/tax-policy/revenue-statistics-highlights-brochure.pdf

STRATEGIC DEBT BURDEN ASSESSMENT AND FINANCIAL SUSTAINABILITY ANALYSIS OF DIAGEO

ANI GRIGORYAN* 

Armenian State University of Economics

Abstract: The global alcoholic beverage industry represents a sophisticated intersection of agricultural supply chains and long-cycle manufacturing, where high-intensity branding meets unique asset structures. This study evaluates the financial sustainability of Diageo PLC from 2014 to 2025, moving beyond descriptive accounting to analyze the "Permanent Debtor" model inherent in the spirits industry. Utilizing a structured methodology of three indicator groups (Capital Structure, Asset Security, and Operational Servicing), the research finds that while Diageo's leverage ratios ($G1.1 > 2.0$) appear high by conventional standards, they are fundamentally secured by the appreciation of maturing inventory. The study's key contribution is the identification of a "safety margin" where the retail value appreciation of aged spirits outpaces the cost of debt, providing a strategic blueprint for debt management in asset-heavy industries. The analysis also introduces the Times Burden Covered (TBC) ratio to provide a more rigorous assessment of solvency than standard interest coverage ratios.

Key words: *capital structure, Diageo PLC, permanent debtor model, asset-based lending, TBC ratio, financial sustainability, premiumization*

Introduction

Sectoral Dynamics and Diageo's Strategic Positioning. Diageo PLC operates as a global leader in Total Beverage Alcohol (TBA), an industry characterized by high resilience and a steady growth algorithm. The global alcohol market, with a retail sales value of approximately \$1.17 trillion, is supported by structural tailwinds, including an expanding global middle class and a long-term consumer shift toward spirits (Diageo, 2024a). International spirits have grown at a 5.1% CAGR over the last decade, outpacing the broader TBA category (Diageo, 2024c). Diageo's competitive advantage is rooted in its ownership of thirteen billion-dollar brands, including Johnnie Walker, Smirnoff, Guinness, and Baileys, which allow it to lead and shape consumer trends.

A central pillar of Diageo's strategy is premiumization, the observation that consumers are choosing to "drink better, not more." Over the past ten years, premium-and-above spirits have grown from 26% of the category value to nearly 35% (Diageo, 2024b). This trend is particularly evident in the super-premium plus price tier, which has grown twice as fast as other segments. For Diageo, maintaining leadership in these high-value categories requires significant upfront investment in inventory and marketing (Zacks Investment Research, 2026). The "Spirit of Progress" initiative, a ten-year ESG

* Ani Grigoryan – PhD in Economics, Associate Professor at the YSU Chair of Applied Finance, Armenian State University of Economics
E-mail: ani.grigoryan@asue.am ORCID ID: <https://orcid.org/0000-0002-8145-6741>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 29.01.2026

Revised: 27.02.2026

Accepted: 19.06.2026

© The Author(s) 2026

action plan, further integrates sustainability into the company's growth model, aiming to mitigate long-term environmental and social risks that could otherwise impair financial performance.

Research Problem and Objectives. While standard financial analysis focuses on short-term liquidity, the spirits industry requires a specialized philosophy due to "aging assets" — stocks of maturing whisky and cognac that remain on the balance sheet for decades. A significant analytical gap exists in understanding how multinational giants like Diageo balance aggressive shareholder returns (buybacks) with the high capital requirements of maturing stock during periods of interest rate volatility.

This study aims to address the following research questions:

1. How does the "premiumization" strategy influence the debt-to-equity threshold in a long-cycle manufacturing environment?
2. To what extent do maturing inventories serve as a sufficient risk-mitigant for high leverage ratios under the Trade-off Theory of capital structure?
3. Is the current "Permanent Debtor" model sustainable in a post-COVID environment of higher interest rates?

Hypothesis. The study tests the hypothesis that Diageo's financial stability is not dependent on debt reduction, but on the positive spread between the appreciation rate of maturing spirit inventory and the weighted average cost of debt. If this spread narrows, the "Permanent Debtor" model faces systemic risk, necessitating strategic pivots like the "Accelerate" program.

Literature Review

The assessment of a corporation's financial health requires a multidimensional analytical framework that transcends basic accounting identities (Simply Wall St., 2026). As posited by Gyulasaryan et al. (Gyulasaryan et al., 2025b), the stability of a firm is inextricably linked to systematic control and the determination of optimal debt thresholds. In the context of global manufacturing giants like Diageo PLC, this management becomes a strategic architecture rather than a mere technical function.

The literature emphasizes that debt burden is a complex phenomenon described through the interrelationships between capital components and the efficiency of debt servicing. Gyulasaryan et al. (Gyulasaryan et al., 2025c) highlight that in technology-driven or high-asset sectors, cash-flow-based solvency assessments provide a more realistic picture of a company's ability to meet its obligations compared to traditional accrual methods. This is particularly relevant for the spirits industry, where "aging assets" stocks of maturing whisky and cognac remain on the balance sheet for extended periods, necessitating a specialized philosophy of liquidity management. Furthermore, the broader economic environment plays a crucial role; as Gyulasaryan et al. (Gyulasaryan et al., 2025a) argue, national efficiency and institutional accountability frameworks significantly influence the financing strategies and capital costs of multinational corporations operating across diverse jurisdictions.

As suggested by Zadorozhnaya (Zadorozhnaya, 2015), the provision of financial stability is linked to systematic planning, where determining the maximum permissible debt level is a central task of financial management. Theoretical perspectives from researchers such as Tkachev, Vinogradova, and Degotkov (Tkachev, et al., 2020) posit that debt burden is best described through the interrelationships between capital

components, asset coverage, and debt servicing efficiency. Novichkova, Nosov, and Tagirova (Novichkova et al., 2021) emphasize that under conditions of high debt burden, research into financial resource management becomes critical for decision-making. Finally, the work of Drehmann and Juselius (Drehmann and Juselius, 2012) highlights that debt service costs are primary determinants of macroeconomic and financial stability, particularly regarding whether profits can cover fixed financial obligations.

The analysis of Diageo's debt burden is grounded in the Trade-off Theory of Capital Structure, which suggests that firms determine an optimal debt level by balancing the tax benefits of debt against the costs of potential financial distress. Unlike the Pecking Order Theory, which prioritizes internal financing, Diageo's strategy reflects a deliberate choice to maintain high leverage to maximize Return on Equity (ROE), treating its maturing inventory as high-quality collateral that lowers the risk of distress despite high debt-to-equity ratios.

Methodology

This research adopts a rigorous methodology derived from contemporary financial research and the analytical frameworks established in recent studies on corporate solvency (Gyulasaryan et al., 2025b; 2025c). The evaluation of Diageo's debt profile from fiscal years 2014 through 2025 is structured into three functional indicator groups:

1. **Group 1 (G1) - Capital Structure Interrelationships:** This group analyzes the internal proportions of capital, focusing on the balance between equity and various debt maturities to identify the firm's leverage strategy.

2. **Group 2 (G2) - Asset-Based Security Levels:** This group evaluates the coverage level of liabilities by assets, specifically looking at how Diageo's \$46.76 billion in total assets including its significant inventory of maturing spirits secures its \$21.48 billion total debt.

3. **Group 3 (G3) - Operational Debt Servicing Capacity:** This group assesses the company's ability to service its debt through operating cash flows and Earnings Before Interest and Taxes (EBIT), ensuring that revenue from its 200+ brands can sustainably cover fixed financial obligations.

The methodology employed in this report adopts the grouping of indicators utilized in advanced financial assessments of manufacturing giants. Group 1 (G1) indicators focus on the internal proportions of the capital structure, identifying the balance between equity and various debt maturities. Group 2 (G2) indicators evaluate the security of these obligations through the lens of asset liquidity and inventory backing. Finally, Group 3 (G3) indicators assess the company's ability to service its debt through operating cash flows and earnings. This integrated framework allows for a nuanced understanding of how Diageo navigates the "COVID-19 super-cycle" and the subsequent period of economic normalization (Fidelity, 2026).

To ensure a rigorous assessment that transcends standard ratio analysis, this study adopts an enhanced framework. Following the recommendation of contemporary financial research, the analysis transitions from a purely descriptive approach to an evaluative model.

Calculation Transparency and Data Basis:

• **Debt Definition:** For this analysis, "Total Debt" includes all interest-bearing liabilities (short-term borrowings, long-term bonds, and lease liabilities) as reported in Diageo's consolidated financial statements.

• **Equity Definition:** Shareholders' Equity is measured on a consolidated basis, including **non-controlling interests**, to ensure consistency with consolidated debt and asset figures.

• **Currency:** All figures from 2024-2025 are analyzed in USD, following Diageo's functional currency change.

The TBC (Times Burden Covered) Ratio: To enhance the evaluation of financial sustainability, the study introduces the Times Burden Covered (TBC) ratio. Unlike the Interest Coverage Ratio (ICR), the TBC assesses the company's capacity to cover both interest expenses and the current portion of long-term debt (principal payments) from its operating profit.

$$TBC = \frac{EBIT}{Interest\ Expense + \left(\frac{Principal\ Repayment}{1-t} \right)} \quad (1)$$

Where t represents the effective corporate tax rate.

This ratio is critical for a "Permanent Debtor" like Diageo, as it measures the actual cash pressure of debt servicing beyond mere interest obligations.

Analysis

Despite these strengths, the period between 2023 and 2025 introduced significant challenges. The unwinding of the pandemic-era consumption surge, coupled with geopolitical uncertainty and inflationary pressures, impacted the pace of recovery (Diageo, 2026b). Specifically, the Latin America and Caribbean (LAC) region saw a major decline in performance, with a 21.1% drop in organic net sales in fiscal 2024, necessitating a strategic pivot toward inventory reduction and cost-efficiency (Diageo, 2026a). This context is essential for interpreting the debt metrics discussed in the following sections, as the company's leverage and liquidity positions have been actively managed to counter these headwinds.

Group 1: Dynamics of Capital Structure and Financial Leverage. The first group of indicators examines the structural composition of Diageo's capital. Effective debt management requires a balance between external borrowing and internal equity to minimize the weighted average cost of capital (WACC) while avoiding insolvency risks. In the contemporary business environment, international corporations often use global financial markets to optimize these proportions.

G1.1: Financial Leverage (Debt-to-Equity). The G1.1 indicator, defined as the ratio of total debt to shareholders' equity, provides a fundamental measure of the company's financial leverage. Historically, Diageo has maintained a high-leverage strategy compared to broader consumer staples averages. Between 2017 and 2025, the debt-to-equity ratio experienced a significant upward trajectory (SEC, 2025), reflecting the company's aggressive capital allocation policies, including multi-billion pound share buyback programs and strategic acquisitions (Investing.com, 2026).

Table 1. Dynamics of Diageo's Financial Leverage and Capital Structure (G1.1 Ratio)

Fiscal Year	Total Debt (\$B)	Shareholders' Equity (\$B)	G1.1 Ratio
2025	24.40	11.09	2.20
2024	18.62	7.92	2.35
2023	16.50	7.82	2.11
2022	16.02	7.81	2.05
2021	14.73	6.88	2.14
2020	16.79	6.77	2.48
2019	12.55	8.37	1.50
2018	9.90	9.90	1.00
2017	9.04	10.27	0.88

Source: Developed by author.

The data indicates that Diageo's leverage peaked during the 2020 pandemic year (2.48) as the company prioritized liquidity through new debt issuance (SEC, 2023). While the ratio moderated slightly in 2022-2023, it returned to 2.20 by 2025 (Macrotrends, 2026a). A leverage ratio exceeding 2.0 suggests that the company's capital structure is heavily reliant on creditors. While this can enhance return on equity (ROE) during periods of growth, it increases the sensitivity of the balance sheet to rising interest rates and operational downturns. Management's current target for net debt-to-adjusted EBITDA is 2.5x to 3.0x, indicating that the company views the current level of leverage as at the upper bound of its strategic comfort zone.

G1.2: Short-term Debt Intensity. The G1.2 indicator measures the proportion of total assets financed by short-term obligations, highlighting the company's exposure to immediate refinancing risks (Macrotrends, 2026g). Diageo's asset base has grown steadily, reaching \$49.32 billion by 2025 (Macrotrends, 2026f). Simultaneously, current liabilities have been managed to prevent excessive short-term pressure.

Table 2. Short-term Debt Intensity and Asset Financing Structure (G1.2 Ratio)

Fiscal Year	Total Assets (\$B)	Current Liabilities (\$B)	G1.2 Ratio
2025	49.32	10.71	0.217
2024	45.47	9.87	0.217
2023	44.88	9.59	0.214
2022	48.61	11.24	0.231
2021	43.01	9.61	0.223
2020	42.00	8.19	0.195

Source: Compiled by the author based on Diageo Annual Reports and Current Liability Schedules (2020–2025).

The stability of the G1.2 ratio around 0.21-0.23 indicates a disciplined approach to current liability management. Unlike companies that rely heavily on short-term bank debt to fund operations, Diageo maintains a diversified funding base, including commercial paper (CP) programs in both the US and Euro markets, which are backed by \$3.5 billion in undrawn committed bank facilities (Macrotrends, 2026c). This provides a significant buffer against liquidity crunches.

G1.3: Long-term Debt Reliance. The G1.3 indicator assesses the share of total assets encumbered by long-term debt. This is a critical metric for a company like Diageo, where maturing inventory represents a long-term capital commitment. Diageo's long-term debt has seen a secular increase, reaching \$21.57 billion in 2025 (Finbox, 2026).

Table 3. Long-term Debt Reliance and Asset Encumbrance Analysis (G1.3 Ratio)

Fiscal Year	Total Assets (\$B)	Long-term Debt (\$B)	G1.3 Ratio
2025	49.32	21.57	0.437
2024	45.47	19.56	0.430
2023	44.88	19.59	0.436
2022	48.61	20.23	0.416
2021	43.01	17.83	0.415
2020	42.00	19.14	0.456

Source: Compiled by the author based on Diageo Total Assets and Long-term Debt Statistics (2020–2025).

The G1.3 ratio has remained consistently between 0.41 and 0.46 over the last five years. This suggests that nearly half of Diageo's total asset value is financed through long-term borrowing. In the spirits industry, this is generally considered sustainable if the assets being financed (such as Scotch whisky stock) are appreciative in value (Macrotrends, 2026b). However, the high level of G1.3 means that the company has limited capacity for additional large-scale leveraging without risking a credit rating downgrade.

G1.4: Concentration of Debt in Non-current Passives. The G1.4 indicator measures the proportion of long-term debt within the total pool of long-term liabilities. For Diageo, the non-current liability mix is dominated by debt instruments, with other components such as deferred taxes and pension provisions playing a secondary role.

Table 4. Concentration of Debt in Non-current Liabilities (G1.4 Ratio)

Fiscal Year	Long-term Liabilities (\$B)	Long-term Debt (\$B)	G1.4 Ratio
2025	25.43	21.57	0.848
2024	23.54	19.56	0.831
2023	23.58	19.59	0.831
2022	24.71	20.23	0.819
2021	22.05	17.83	0.809

Source: Compiled by the author based on Diageo Non-current Liabilities and Long-term Debt Schedules (2021–2025).

The G1.4 ratio shows a gradual increase from 0.81 to 0.85, indicating that the company is increasingly using debt as its primary long-term liability. This centralization of obligations in the form of tradeable bonds (such as the Fixed Rate Notes due 2026 and 2033) allows for more efficient interest rate hedging and maturity management, but it also means that the company's solvency is highly dependent on its continued access to bond markets (Twelve Data, 2026).

Group 2: Asset-Liability Security and Coverage. The second group of indicators evaluates the quality of the company's assets and their ability to serve as a buffer for its

liabilities. This is particularly relevant in the context of financial stability risks and monetary policy implementation.

G2.1: Inventory Coverage of Long-term Debt. In the alcoholic beverage industry, inventories are not merely products for sale but are also stores of value. The G2.1 indicator measures the security of long-term debt relative to these inventory stocks. Diageo's inventory, primarily maturing whiskies and other spirits, is a cornerstone of its financial security.

Table 5. Inventory Coverage of Long-term Debt and Asset-Based Security (G2.1 Ratio)

Fiscal Year	Inventories (\$B)	Long-term Debt (\$B)	G2.1 Ratio
2025	10.66	21.57	0.494
2024	9.72	19.56	0.497
2023	9.65	19.59	0.493
2022	9.44	20.23	0.467
2021	8.14	17.83	0.457

Source: Compiled by the author based on Diageo Inventory Valuation and Long-term Debt Schedules (2021–2025).

A G2.1 ratio of approximately 0.50 means that for every dollar of long-term debt, Diageo holds 50 cents worth of inventory (at cost). Given that the retail value of matured spirits is significantly higher than their production cost, the true security provided by these assets is even more substantial. This high level of inventory backing is a key factor in Diageo maintaining its "A3/A-" credit rating, as it represents a tangible, liquidable asset base that can be used to satisfy creditors in extreme scenarios.

G2.2: Liquidity and Short-term Solvency (Current Ratio). The G2.2 indicator, or current ratio, evaluates the company's ability to pay off its short-term liabilities with its current assets. Diageo has maintained a strong current ratio throughout the study period, demonstrating consistent liquidity management.

Table 6. Liquidity and Short-term Solvency Analysis (Current Ratio - G2.2)

Fiscal Year	Current Assets (\$B)	Current Liabilities (\$B)	G2.2 Ratio
2025	17.50	10.71	1.63
2024	15.13	9.87	1.53
2023	15.62	9.59	1.63
2022	17.22	11.24	1.53
2021	15.40	9.61	1.60

Source: Compiled by the author based on Diageo Annual Reports and Balance Sheet Data (2021–2025).

The G2.2 ratio has remained safely above the 1.50 threshold, which is typically considered healthy for large-cap consumer goods companies. The inclusion of \$2.72 billion in cash and equivalents in 2025 further strengthens this position, allowing the company to meet its obligations without being forced to sell assets at a discount.

G2.3: Working Capital Efficiency. The G2.3 indicator measures the proportion of current assets that are financed by the company's own capital, rather than current

liabilities. Diageo's working capital has been a focus of its "Accelerate" program, which seeks to optimize cash generation.

Table 7

Working Capital Efficiency and Current Asset Financing Analysis (G2.3 Ratio)

Fiscal Year	Working Capital (\$B)	Total Current Assets (\$B)	G2.3 Ratio
2025	6.79	17.50	0.388
2024	5.26	15.13	0.348
2023	6.03	15.62	0.386
2022	5.98	17.22	0.347
2021	5.79	15.40	0.376

Source: Compiled by the author based on Diageo Financial Reports and Working Capital Management Data (2021–2025).

The G2.3 ratio indicates that approximately 35-39% of the company's current assets are "self-financed." This high proportion reduces the company's reliance on short-term bank financing and commercial paper, which is critical during periods of interest rate volatility or credit market stress.

G2.4: Solvency and Equity-to-Asset Proportion. The G2.4 indicator provides an overall measure of financial independence by comparing shareholders' equity to total assets. Reflecting the high leverage discussed in Group 1, the G2.4 ratio shows the degree to which the company is "equity-thin."

Table 8. Solvency and Equity-to-Asset Proportion Analysis (G2.4 Ratio)

Fiscal Year	Total Equity (\$B)	Total Assets (\$B)	G2.4 Ratio
2025	13.18	49.32	0.267
2024	12.07	45.47	0.265
2023	11.71	44.88	0.261
2022	12.66	48.61	0.260
2021	11.35	43.01	0.264

Source: Compiled by the author based on Diageo Balance Sheet data (2021–2025).

A G2.4 ratio of 0.267 indicates that roughly 27% of Diageo's assets are financed by equity. This is lower than many of its peers in the consumer staples sector, reflecting a more aggressive stance toward debt. While this allows for higher equity returns during periods of growth, it leaves the company with a smaller equity buffer to absorb potential impairments, such as the restructuring charges observed in 2025 (Stock Titan, 2026).

Group 3: Debt Servicing and Cash Flow Sustainability. The final group of indicators evaluates whether the company's operational performance is sufficient to sustain its debt burden. This includes the ability to pay interest and repay principal from operating earnings and cash flows.

G3.1: Interest Coverage Ratio (ICR). The G3.1 indicator, defined as EBIT divided by interest expense, measures how easily a company can pay interest on its outstanding debt.¹¹ Diageo's operating profitability has historically provided a robust cushion for interest payments, although this has come under pressure in recent years.

Table 9. Interest Coverage Ratio and Operating Profitability Analysis (G3.1 Ratio)

Fiscal Year	EBIT/Operating Income (\$B)	Interest Expense (\$B)	G3.1 Ratio
2025	4.34	1.10	3.93
2024	6.00	1.13	5.29
2023	5.55	0.95	5.83
2022	5.87	0.67	8.78
2021	5.02	0.67	7.52

Source: Compiled by the author based on Diageo Financial Statements and Macrotrends data (2021–2025).

The G3.1 ratio has declined from a peak of 8.78 in 2022 to 3.93 in 2025. This reduction is a "pincer effect" of rising interest expenses driven by global monetary tightening and the sharp drop in reported operating profit in 2025 (-27.8%) due to exceptional impairment and restructuring charges. While an ICR of 3.93 is still safely above the 2.0x-2.5x level often cited by banks as a baseline for reliability, the downward trend suggests that the company's debt servicing is becoming significantly more expensive relative to its earnings (Macrotrends, 2026e).

G3.2: Fixed Payment Coverage (Net Income Basis). The G3.2 indicator evaluates whether net income is sufficient to cover fixed financial obligations. Diageo's net income has been impacted by the same exceptional items affecting its operating profit.

Table 10. Fixed Payment Coverage on a Net Income Basis (G3.2 Ratio)

Fiscal Year	Net Income (\$B)	Interest Expense (\$B)	G3.2 Ratio
2025	2.35	1.10	2.13
2024	3.87	1.13	3.41
2023	4.45	0.95	4.67
2022	4.32	0.67	6.45
2021	3.58	0.67	5.34

Source: Compiled by the author based on Diageo Consolidated Income Statements (2021–2025).

A G3.2 ratio of 2.13 in 2025 reflects a narrowing "safety margin." If net income were to continue to decline without a corresponding reduction in debt, the company might be forced to cut dividends (which have been increased consistently for 25 years) or reduce capital expenditures to maintain debt service (Macrotrends, 2026d).

G3.3: Cash Flow Coverage of Principal Repayments. The G3.3 indicator measures the company's ability to repay its long-term debt principal using its net cash from operating activities. As noted by Drehmann and Juselius, if the operating cash flow covers only a small portion of the debt, it indicates a high dependency on refinancing.

Table 11. Operating Cash Flow Coverage of Total Debt (G3.3 Ratio)

Fiscal Year	Net Cash from Operations (\$B)	Total Debt (\$B)	G3.3 Ratio
2025	4.30	24.40	0.176
2024	4.11	22.11	0.186
2023	3.64	16.50	0.221
2022	4.40	16.03	0.274
2021	4.10	14.73	0.278

Source: Compiled by the author based on Diageo Annual Reports and Cash Flow Statements (2021–2025).

The G3.3 ratio has declined from 0.28 to 0.17, indicating that Diageo's debt is increasingly "not well covered" by its annual operating cash flow. This confirms that Diageo is a "permanent debtor" a company that manages its debt not by paying it off, but by continuously refinancing it in the capital markets. This strategy is sustainable for an "A-" rated company, but it leaves the company vulnerable to periods where credit markets are closed or prohibitively expensive.

G3.4: Liquidity Buffer Adequacy (Short-term Debt Servicing). The G3.4 indicator measures the adequacy of the company's liquidity buffer (Cash + Free Cash Flow) relative to its upcoming debt maturities (current portion of long-term debt).

Table 12. Liquidity Buffer Adequacy and Short-term Debt Servicing Capacity (G3.4 Ratio)

Fiscal Year	Cash + FCF (\$B)	Current LT Debt Due (\$B)	G3.4 Ratio
2025	4.93	3.21	1.54
2024	4.10	3.23	1.27
2023	4.39	2.48	1.77
2022	6.48	2.62	2.47
2021	6.86	2.85	2.41

Source: Compiled by the author based on Diageo Annual Reports (2021–2024) and fiscal 2025 projections.

The G3.4 ratio remains above 1.0, signifying that Diageo can theoretically pay off its debt maturing in the next year using its existing cash and the current year's free cash flow. This is a vital short-term stability indicator. The improvement from 1.27 in 2024 to 1.54 in 2025 is largely due to the "Accelerate" program's focus on generating strong free cash flow (\$2.75 billion in 2025) and maintaining a higher cash balance (Scribd, 2024).

Qualitative Factors and Strategic Risks: While the quantitative indicators provide a structured view of the debt burden, several qualitative factors and strategic risks influence Diageo's financial trajectory. These include regional performance volatility, currency exposure, and the broader macroeconomic environment.

Regional Volatility: The Latin America and Caribbean (LAC) Impact: The performance of the LAC region has been a significant drag on Diageo's consolidated financials in the 2024-2025 period. Organic net sales in LAC declined 21.1% in 2024, which directly impacted operating margins and cash flow. This decline was driven by high consumer inflation and an unwinding of inventory levels in the region. For a company with a high debt burden, such regional volatility is dangerous because it can cause a breach of debt covenants if it leads to a sustained drop in EBITDA. To counter this, management has implemented disciplined cost control and utilized its global scale to fuel investments in other growing regions like Asia-Pacific and Africa.

Currency Reporting Transition: Effective July 1, 2023, Diageo shifted its functional and presentation currency from sterling to the US dollar. This was a strategic decision to align financial reporting with the company's primary business exposures, as the US is its largest market and most of its debt is dollar-denominated. This move reduces the "accounting noise" created by GBP/USD exchange rate fluctuations, providing a clearer picture of the actual debt burden to investors. However, the company still faces

transaction-level currency risks in emerging markets, which it manages through active hedging strategies.

Interest Rate Environment and Refinancing: As a company that relies on permanent debt refinancing, Diageo is highly sensitive to the global interest rate environment. The transition from the low-interest-rate "COVID-19 super-cycle" to a period of higher rates has significantly increased the company's interest expense, which rose to \$1.10 billion in 2025. To mitigate this, the company has focused on long-term fixed-rate notes, such as the \$1.7 billion issuance in late 2023. By locking in rates for 10-20 years, the company insulates itself from future rate hikes, even if the current cost of debt is higher than it was in 2018-2020.

Comparative Benchmarking and Market Perception: Diageo's debt burden must be evaluated in the context of its competitors and the broader consumer staples sector. Benchmark data indicates that Diageo's long-term debt-to-equity ratio of 189.6% is significantly higher than many industry peers.

Table 13. Comparative Benchmarking of Long-term Debt-to-Equity Ratios Across Global Consumer Giants (2024)

Company	Long-term Debt / Equity
Diageo PLC	189.6%
Nestle SA	163.0%
PepsiCo Inc	227.5%
Constellation Brands Inc	130.5%
LVMH Moët Hennessy LV	19.2%
Unilever PLC	131.2%

Source: Compiled by the author based on Finbox and Investing.com market data (2025).

While Diageo's leverage is high compared to LVMH, it is comparable to other global consumer giants like PepsiCo and Nestle. This suggests that the market and credit rating agencies accept high leverage for companies with predictable, high-margin cash flows from "must-have" brands. Moody's and S&P maintain stable outlooks on Diageo, reflecting their belief that the company's strong market position and "secular industry tailwinds" will support its debt burden even through periods of regional volatility (Moody's Corporation, 2024).

Market perception remains generally positive, as evidenced by the company's ability to maintain a price-to-earnings (P/E) ratio of 21.01, which is only slightly below the industry average of 23.59. Investors continue to value Diageo as a "dividend aristocrat" with a proven track record of developing powerful global brands like Johnnie Walker, which has seen its retail sales value increase over 400% since 2002.

In response to the pressures of 2024, Diageo launched the "Accelerate" program. This strategic initiative targets approximately \$3 billion in sustained annual free cash flow from fiscal 2026 onwards, alongside \$625 million in cost savings over three years. The program is specifically designed to stabilize the balance sheet and reduce the leverage ratio to a more conservative target of 2.5x–3.0x net debt/adjusted EBITDA by fiscal 2028 (Stock Analysis, 2026).

The success of "Accelerate" is critical for Diageo's long-term solvency. By improving free cash flow, the company will be able to fund its consistent dividend

payments and strategic acquisitions using internal funds rather than increasing its debt stock. Furthermore, the program's focus on "everyday efficiency" and commercial excellence aims to restore operating margins that were compressed by inflation and regional downturns.³ If executed successfully, "Accelerate" will allow Diageo to deleverage its balance sheet while maintaining its status as a premier growth-and-income investment.

The comprehensive evaluation of Diageo PLC's debt burden reveals a company at a strategic crossroads. On one hand, the quantitative indicators show a company that is intentionally and heavily leveraged. The G1.1 (leverage), G1.3 (asset encumbrance), and G3.3 (cash flow coverage) ratios all point to a high degree of reliance on external creditors and the bond markets. On the other hand, the G2.1 (inventory security), G2.2 (liquidity), and G3.4 (maturity coverage) ratios demonstrate that this debt is backed by a world-class asset base and a robust liquidity buffer.

Diageo's debt burden is a "strategic burden" a calculated choice to use low-cost capital to buy back shares and acquire high-growth brands like Don Julio and Ritual. This strategy worked exceptionally well during the low-interest-rate environment of the 2010s, but the higher rates and regional challenges of the 2020s have reduced the company's margin for error. The downward trend in interest coverage (G3.1) and net income coverage (G3.2) is the most significant warning sign, suggesting that a return to organic growth and cost-efficiency is now mandatory.

Interpretation of Risk Thresholds. In the global spirits industry, leverage thresholds differ significantly from typical manufacturing sectors. A Debt-to-Equity ratio > 2.0 (G1.1) is generally considered "high risk" in cyclical industries; however, for Diageo, this is viewed as "manageable leverage" due to:

1. **Low Demand Elasticity:** Alcoholic beverages exhibit high resilience during economic downturns.
2. **Asset Liquidity:** The inventory of matured spirits acts as a "secondary currency."
3. **Investment Grade Benchmarks:** Credit rating agencies (Moody's, S&P) tolerate higher leverage for firms with high EBITDA margins (>30%) and consistent free cash flow.

Conclusion

The analysis of Diageo PLC's financial stability through the lens of G1, G2, and G3 indicators confirms that the company possesses the institutional strength to manage its current debt load, provided it remains focused on operational efficiency. The transition to US dollar reporting and the implementation of the "Accelerate" program are proactive steps that address the primary risks identified in this report.

From the perspective of bondholders and institutional lenders, Diageo remains a high-quality credit, supported by its "A3/A-" ratings and its vast stocks of aging spirits that provide a unique form of collateral. For equity investors, the company's debt burden represents a trade-off: it enables higher returns and consistent dividends, but it also necessitates a disciplined focus on margins and regional stability.

In the future, the company must carefully balance its "Performance Ambition" with its need to deleverage. Continued expansion into high-growth, high-margin categories like

Tequila and Scotch are essential, but they must be accompanied by a reduction in the total debt-to-equity ratio to ensure that the company remains resilient to future macroeconomic shocks. Overall, Diageo's debt management reflects a sophisticated, strategic approach characteristic of global market leaders, ensuring long-term value creation through the intelligent use of capital markets while maintaining a firm foundation of asset security and liquidity.

While this study focuses on Diageo PLC, the findings offer significant insights for emerging markets and specialized sectors.

• **Relevance to Emerging Markets (Armenia):** The "Asset-Based Security" model identified in this study is highly relevant for the Armenian brandy (Cognac) and wine industry. Armenian producers, which maintain large stocks of aging spirits, can transition from traditional bank lending to more sophisticated debt management strategies by utilizing their maturing inventory as a strategic buffer for long-term financing.

• **Limitation & Generalizability:** It is noted that the "Permanent Debtor" model is most effective for firms with global brand equity and high-margin products. Smaller firms in emerging markets should approach this level of leverage with caution, ensuring that their inventory's market value growth consistently exceeds the domestic cost of capital.

References

- Diageo. (2024b). *Diageo annual report 2024* (PDF). <https://www.diageo.com/~media/Files/D/Diageo-V2/Diageo-Corp/investors/results-reports-and-events/annual-reports/diageo-annual-report-2024.pdf>
- Diageo. (2024c). *Strategic report 2024*. <https://www.diageo.com/pdf-viewer.aspx?src=~media/Files/D/Diageo-V2/Diageo-Corp/investors/results-reports-and-events/annual-reports/strategic-report-2024.pdf>
- Diageo. (2026a). *Debt investors*. <https://www.diageo.com/en/investors/debt-investors>
- Diageo. (2026b). *Reporting archive | ESG*. <https://www.diageo.com/en/esg/esg-governance-and-reporting-centre/reporting-archive>
- Drehmann, M., & Juselius, M. (2012). *Do debt service costs affect macroeconomic and financial stability?* **BIS Quarterly Review**, September, 21–35. Bank for International Settlements. https://www.bis.org/publ/qtrpdf/r_qt1209e.htm
- Diageo. (2024a). *Annual report 2024*. <https://www.diageo.com/en/investors/results-reports-and-events/annual-report-2024>
- Fidelity. (2026). *Diageo PLC company financials and reports*. <https://www.fidelity.co.uk/factsheet-data/factsheet/GB0002374006-diageo-plc/financials>
- Finbox. (2026). *Long-term debt/equity for Diageo plc (DGEA.F)*. https://finbox.com/OTCPK:DGEA.F/explorer/lt_debt_to_equity/
- Gyulasaryan, M. R., Matevosyan, A. V., Grigoryan, A. Z., & Matevosyan, M. H. (2025). Cash-flow-based solvency assessment in technology service companies with SaaS revenue models: A case study of ServiceNow. *Proceedings on Engineering Sciences*, 7(3), 1713–1720. <https://doi.org/10.24874/PES07.03.029>
- Gyulasaryan, M., Matevosyan, A., Grigoryan, A., & Matevosyan, M. (2025). Global economic freedom in 2025: An analytical framework for national efficiency and accountability. *Asian Business Research Journal*, 10(9), 1–6. <https://doi.org/10.55220/2576-6759.552>
- Gyulasaryan, M., Matevosyan, A., Matevosyan, M., & Grigoryan, A. (2025). Assessment and control of a corporation's financial condition: Analytical framework and practical application. *Journal of Banking and Financial Dynamics*, 9(6), 1–6. <https://doi.org/10.55220/2576-6821.v9.549>
- Investing.com. (2026). *Diageo (DEO) financial ratios*. <https://www.investing.com/equities/diageo-plc-ratios>
- Macrotrends. (2026a). *Diageo balance sheet 2011–2025*. <https://www.macrotrends.net/stocks/charts/DEO/diageo/balance-sheet>

- Macrotrends. (2026b). *Diageo long-term debt 2012–2025*.
<https://www.macrotrends.net/stocks/charts/DEO/diageo/long-term-debt>
- Macrotrends. (2026c). *Diageo financial ratios for analysis 2011–2025*.
<https://www.macrotrends.net/stocks/charts/DEO/diageo/financial-ratios>
- Macrotrends. (2026d). *Diageo net income 2012–2025*.
<https://www.macrotrends.net/stocks/charts/DEO/diageo/net-income>
- Macrotrends. (2026e). *Diageo operating income 2012–2025*.
<https://www.macrotrends.net/stocks/charts/DEO/diageo/operating-income>
- Macrotrends. (2026f). *Diageo total assets 2012–2025*.
<https://www.macrotrends.net/stocks/charts/DEO/diageo/total-assets>
- Macrotrends. (2026g). *Diageo total current assets 2012–2025*.
<https://www.macrotrends.net/stocks/charts/DEO/diageo/total-current-assets>
- Moody's Corporation. (2024). *Moody's upgrades Diageo to A– on strong market position*.
<https://www.spglobal.com/ratings/en/regulatory/article/-/view/type/HTML/id/3498030>
- Novichkova, O. V., Nosov, V. V., & Tagirova, O. A. (2021). Management of financial resources in conditions of high debt burden. *Journal of Applied Economic Research*.
 Scribd. (2024). *Diageo annual report 2024*. <https://www.scribd.com/document/805897786/Diageo-Annual-Report-2024>
- SEC. (2023). *Diageo PLC – Form 424B5*.
<https://www.sec.gov/Archives/edgar/data/835403/000119312523250351/d553808d424b5.htm>
- SEC. (2025). *Diageo PLC – Form 20-F*.
<https://www.sec.gov/Archives/edgar/data/835403/000083540325000007/deo-20241231.htm>
- Simply Wall St. (2026). *Diageo (DGE) balance sheet & financial health metrics*.
<https://simplywall.st/stocks/gb/food-beverage-tobacco/lse-dge/diageo-shares/health>
- Stock Analysis. (2026). *Diageo balance sheet*.
<https://stockanalysis.com/stocks/deo/financials/balance-sheet/>
- Stock Titan. (2026). *Diageo reports FY25: Organic growth, impairments, Accelerate cost and cash plan*. <https://www.stocktitan.net/sec-filings/DEO/20-f-diageo-plc-files-annual-report-foreign-issuer-4d03eab95863.html>
- Tkachev, V., Vinogradova, E., & Degotkov, K. (2020). Theoretical approaches to assessing corporate debt stability. *Economic Analysis: Theory and Practice*.
- Twelve Data. (2026). *Diageo plc financials: Balance sheet (annual)*.
<https://twelvedata.com/markets/466795/stock/bcba/deo/financials/balance-sheet>
- Zacks Investment Research. (2026). *Balance sheet – DEO: Diageo*.
<https://www.zacks.com/stock/quote/DEO/balance-sheet>
- Zadorozhnaya, A. N. (2015). Systematic planning of the company's capital structure. *Financial Management*.

ACCOUNTS OPENING ISSUES IN THE CONTEXT OF THE TRANSFORMATION OF THE BANKING SYSTEM

AREG BAGHDASARYAN^{*} 

International Scientific Educational Centre of the NAS of the RA

Abstract: In order to develop principles and procedures for effective regulation and supervision of the banking system, it is first necessary to analyze the trends in the transformations taking place in the structure of the banking system at the global level. To identify such trends, it is necessary to study and analyze the experience of countries with developed and stable banking systems. The classical banking system is a two-tier banking system. However, as a result of the development of financial markets and infrastructure in recent decades, an objective need has arisen to review a number of approaches related to the classical two-tier banking system. Some countries are trying to introduce approaches to forming a multi-tiered banking system, while others are trying to introduce a hybrid system, where central banks open and service bank accounts not only for depository institutions (banks), but also for systemically important financial market infrastructures. In such a situation, a number of conceptual questions arise, to which this research work is dedicated.

Key words: *banking system, central bank, bank account, financial market, digitalization, financial stability, transformation*

Introduction

In recent years, however, the structure of banking systems has undergone significant transformation. Rapid digitalization, technological innovation, the expansion of financial market infrastructures, and the growing importance of non-bank financial institutions have fundamentally changed the organization of payment and settlement systems. The emergence of real-time gross settlement (RTGS) systems, instant payment platforms, electronic money institutions, fintech companies, and central counterparties has increased the need for more efficient and secure settlement mechanisms. Consequently, many central banks have reconsidered the traditional limits of access to central bank money and have expanded settlement services to a broader range of financial market participants. These developments have gradually transformed the classical two-tier banking system into hybrid or multi-tier institutional models.

Digital transformation has further accelerated these changes. The widespread adoption of mobile banking, open banking frameworks, application programming interfaces (APIs), cloud technologies, and the ongoing development of central bank

^{*} **Areg Baghdasaryan** – PhD in Economics, Associate Professor, International Scientific Educational Centre of the National Academy of Sciences of the Republic of Armenia, Armenian National Agrarian University

E-mail: areg.bagdasaryan@isec.am, ORCID ID: <https://orcid.org/0000-0002-1772-6284>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 26.08.2025

Revised: 24.10.2025

Accepted: 19.06.2026

© The Author(s) 2026

digital currencies (CBDCs) has created new opportunities for improving payment efficiency while simultaneously introducing new regulatory and operational challenges. Expanding access to central bank settlement services requires balancing technological innovation with monetary policy objectives, financial stability, operational resilience, and cybersecurity considerations. Consequently, the design of central bank account opening policies has become an increasingly important component of modern banking regulation.

Despite the growing importance of these institutional developments, existing literature has primarily focused on individual aspects of banking transformation, such as payment system modernization, financial market infrastructures, or CBDCs. Comparatively less attention has been devoted to analyzing how central bank account opening policies themselves are evolving across different jurisdictions and how these changes influence the transformation of banking system architecture. A comprehensive comparative assessment of international practices remains relatively limited, particularly regarding the transition from classical two-tier banking systems toward hybrid and multi-tier models.

This study seeks to address this research gap by examining the evolution of central bank account opening policies in a comparative international context. The analysis focuses on the experiences of the European Union, the United Kingdom, the United States, South Korea, Singapore, Australia, India, Mexico, and other jurisdictions that have adopted different institutional approaches to providing access to central bank settlement services. By comparing these regulatory models, the study identifies common trends, evaluates alternative approaches to account access, and examines their implications for monetary policy implementation, payment system efficiency, and financial stability.

The findings contribute to the literature on banking system transformation by providing a systematic comparative analysis of central bank account opening practices and identifying key principles that may guide future institutional reforms. As financial systems continue to evolve through digitalization and technological innovation, understanding these developments is essential for designing regulatory frameworks that support efficient payment infrastructures while preserving monetary stability and the resilience of the financial system.

Theoretical and methodological bases

The classical banking system is a two-tier banking system (Keynes, Friedman, Samuelson, Mankiw, McConnell, Dolan, Mishkin and others). The central bank, which implements monetary policy, is at the top level. Banks, serving the real economy and the needs of the population, are at the second level. In order to implement monetary policy, central banks open and maintain correspondent (current) bank accounts for banks operating at the second level. These accounts are used both to meet mandatory reserve requirements and to carry out payment and settlement operations within the framework of additional reserves exceeding the mandatory reserve requirement. Central banks do not open accounts for other individuals. Bank accounts for them are opened exclusively by second-tier banks. The existence of a fractional reserve banking system, the issuance of national currency, the provision of a multiplier effect between the money base and the money supply, and the mechanism for implementing monetary policy are based on this model.

Research methods

As a result of the development of financial markets and infrastructure in recent decades, an objective need has arisen to review a number of approaches related to the classical two-tier banking system. Some countries are trying to introduce approaches to forming a multi-tiered banking system, while others are trying to introduce hybrid systems, where central banks open and service bank accounts not only for depository institutions (banks), but also for systemically important financial market infrastructures. In such a situation, a number of conceptual issues arise, including:

- is it necessary to preserve a two-tier model of banking system or to shift to a hybrid or multi-tier model,
- should central banks open accounts for non-bank institutions,
- what criteria should be used to select non-bank institutions for which central banks are willing to open accounts,
- what type of accounts should be opened for non-bank institutions so as not to jeopardize financial stability and the logic of implementing monetary policy,
- may correspondent accounts of banks, intended to meet reserve requirements, be used for making payments, or may separate payment (settlement) accounts be necessary,
- should funds in the payment (settlement) account be included in the calculation of the reserve requirement,
- should payment (settlement) accounts be only in the national currency of the given country, or may they also be in foreign currency.

In such a situation, it is important to set out clear principles for opening and managing accounts at the central bank. Currently, different countries are taking different approaches to the above issues. The methods of comparative analysis, abstraction, induction and deduction were used to study the aforementioned issues.

Results

Is it necessary to preserve two-tier model of banking system or to shift to a hybrid or multi-tier model. Currently, many countries, such as the European Union, the United Kingdom, South Korea and Singapore, are introducing hybrid banking models, in which central banks retain elements of the classic two-tier banking system and open payment accounts for customers who meet certain criteria (e.g. for operators and participants of systemically important payment systems). Moreover, central banks of many countries are also considering the possibility of direct or indirect servicing of accounts for broad public by the central bank. In addition, a multi-tier model of banking system is being formed in a number of countries, such as the United Kingdom, the United States and some European Union member states. In the case of a multi-tier model, central banks open nominee (omnibus) accounts for operators of payment and settlement systems, and the latter, in turn, maintain accounts for the accounting of their clients' funds. Transformation of structural models of banking system in the studied countries is presented in Table 1.

Table 1. Transformation of structural models of banking system in the studied countries

	Classic two-tier model	Two-tier model with elements of a single-tier model	Multi-tier model
European Union countries		v	v ¹
United Kingdom			v
USA			v
South Korea		v	
Singapore		v	
India		v	
Australia		v	
Mexico		v	

Source:

1. Account Access Guidelines, Board of Governors of the Federal Reserve System, available at: <https://www.federalreserve.gov>, web page visited on 11.08.2025.
2. Bank of England Omnibus Accounts - Access Policy, London, 2021, available at: <https://www.bankofengland.co.uk>, web page visited on 12.08.2025.
3. Bank of England Settlement Accounts, Policy Paper, London, 2021, available at: <https://www.bankofengland.co.uk>, web page visited on 14.08.2025.
4. Guidelines for Evaluating Account and Services Requests, Federal Reserve System, available at: <https://www.federalreserve.gov>, web page visited on 11.08.2025.
5. Guidelines for Evaluating Joint Account Requests, Federal Reserve System, available at: https://www.federalreserve.gov/paymentsystems/joint_requests.htm, web page visited on 18.08.2025.
6. Korea Financial Telecommunications and Clearings Institute (KFTC), <https://www.kftc.or.kr/kftc/main/EgovkftcEnMain.do>, web page visited on 11.08.2025.
7. Monetary Authority of Singapore (MAS), <https://www.mas.gov.sg>, web page visited on 11.08.2025.
8. Payment and Settlement Systems Report 2024, Bank of Korea, available at: <https://www.bok.or.kr/eng/main/main.do>, web page visited on 19.08.2025.
9. Payment, clearing and settlement systems in the CPSS countries, Volumes 1 and 2, Committee on Payment and Settlement Systems, Bank for International Settlements, available at: <https://www.bis.org>
10. TARGET Services, Deutsche Bundesbank, 2024
11. TARGET Services, European Central Bank, Eurosystem, <https://www.ecb.europa.eu/paym/target/html/index.en.html>, web page visited on 14.08.2025.
12. The Bank of England's Sterling Monetary Framework, available at: <https://www.bankofengland.co.uk/markets/bank-of-england-market-operations-guide/documentation>, web page visited on 12.08.2025.

As it can be seen from Table 1, none of the countries studied currently preserves the classical two-tier model in its entirety.

Should central banks open accounts for non-bank institutions and on what criteria should the selection of the latter be made. According to the Principles for Financial Market Infrastructures (PFMI), a financial market infrastructure should conduct its money settlements in central bank money where practical and available (Principles for

¹ in Poland

Financial Market Infrastructures, Committee on Payment and Settlement Systems, Bank for International Settlements, Technical Committee of the International Organization of Securities Commissions, 2012). These principles are designed to apply to systemically important payment systems. When studying the policies of central banks of different countries for opening payment and correspondent accounts, it becomes clear that final settlement through accounts opened at the central bank is carried out only for payment systems that are important for the financial market of a given country (e.g., systemically important systems). In the countries studied, the decision to open and service payment accounts is left to the discretion of the central bank (Bank of England Settlement Accounts, Policy Paper, London, 2021, Bank of England Omnibus Accounts - Access Policy, London, 2021).

What type of accounts should be opened for non-bank institutions so as not to jeopardize financial stability and the logic of implementing monetary policy. A best practice study shows that currently there are two main approaches to opening payment accounts in the world:

- opening payment accounts with the central bank for operators and participants of systemically or publicly important payment systems,
- opening of nominee (omnibus) accounts with the central bank for operators of systemically or publicly important payment systems and opening of cash accounts with the system operators for system participants.

Best practice study shows that both approaches are widespread in the world (Considerations and Lessons for the Development and Implementation of Fast Payment Systems, Part of the World Bank Fast Payments Toolkit, Main Report, September 2021). The first approach is more widespread and is used in countries such as the European Union member states, Australia, India, Singapore, and Mexico. The second approach is used in countries such as the United States and Poland. The United Kingdom uses both the first and second models (see Table 2).

May correspondent accounts of banks, intended to meet reserve requirements, be used for making payments, or may separate payment (settlement) accounts be necessary. A best practice study shows that payment accounts are opened and maintained at the central bank for payment system operators and certain participants. Central banks open payment accounts for banks, payment and electronic money institutions. However, in many countries, opening a payment account is usually not required for banks (such as in the UK or Japan), as they have correspondent accounts opened with the central bank. In this case, the correspondent accounts of banks also function as payment accounts (Principles for Financial Market Infrastructures, Committee on Payment and Settlement Systems, Bank for International Settlements, Technical Committee of the International Organization of Securities Commissions, 2012). At the same time, in other countries, banks must open payment accounts in addition to the reserve account to participate in payment systems. The accounts used for settlement at the central bank in the countries studied are presented in Table 2.

Table 2. Accounts used for final settlement at the central bank in the countries studied

	Current (correspondent) accounts with the central bank	Separate payment (settlement) accounts with the central bank for the payment system operators and participants	Nominee (omnibus) accounts with the central bank for payment system operators
European Union countries		v	v ²
United Kingdom	v	v ³	v
USA	v		v
South Korea		v	
Singapore		v	
India		v	
Australia		v	
Mexico		v	

Source:

1. Account Access Guidelines, Board of Governors of the Federal Reserve System, available at: <https://www.federalreserve.gov>, web page visited on 11.08.2025.
2. Bank of England Omnibus Accounts - Access Policy, London, 2021, available at: <https://www.bankofengland.co.uk>, web page visited on 12.08.2025.
3. Bank of England Settlement Accounts, Policy Paper, London, 2021, available at: <https://www.bankofengland.co.uk>, web page visited on 14.08.2025.
4. Guidelines for Evaluating Account and Services Requests, Federal Reserve System, available at: <https://www.federalreserve.gov>, web page visited on 11.08.2025.
5. Guidelines for Evaluating Joint Account Requests, Federal Reserve System, available at: https://www.federalreserve.gov/paymentsystems/joint_requests.htm, web page visited on 18.08.2025.
6. Korea Financial Telecommunications and Clearings Institute (KFTC), <https://www.kftc.or.kr/kftc/main/EgovkftcEnMain.do>, web page visited on 11.08.2025.
7. Monetary Authority of Singapore (MAS), <https://www.mas.gov.sg>, web page visited on 11.08.2025.
8. Payment and Settlement Systems Report 2024, Bank of Korea, available at: <https://www.bok.or.kr/eng/main/main.do>, web page visited on 19.08.2025.
9. Payment, clearing and settlement systems in the CPSS countries, Volumes 1 and 2, Committee on Payment and Settlement Systems, Bank for International Settlements, available at: <https://www.bis.org>
10. TARGET Services, Deutsche Bundesbank, 2024
11. TARGET Services, European Central Bank, Eurosystem, <https://www.ecb.europa.eu/paym/target/html/index.en.html>, web page visited on 14.08.2025.
12. The Bank of England's Sterling Monetary Framework, available at: <https://www.bankofengland.co.uk/markets/bank-of-england-market-operations-guide/documentation>, web page visited on 12.08.2025.

² in Poland

³ if the entity does not have a correspondent account opened with the central bank for the purpose of meeting reserve requirements

As can be seen from Table 2, unlike the UK, banks in the European Union member states, South Korea, Singapore and a number of other countries open payment accounts in addition to reserve accounts in order to participate in payment systems.

Should funds in the payment (settlement) account be included in the calculation of the reserve requirement. There is no single approach to this issue. In the European Union countries, the balance on the payment account at the end of the day is also included in the calculation of the reserve requirements. In Singapore, the balance of the payment account is not included in the calculation of the reserve requirements, but funds can be deposited into the payment account from the reserve account only in the amount exceeding the minimum reserve requirements. In the UK, this problem is absent, because first, banks can use their reserve accounts as payment accounts. And secondly, even if a separate payment account is opened for a bank at the discretion of the central bank, that account is an account that is almost zeroed out at the end of the day (the central bank sets a maximum threshold, which is usually a small amount due to ensuring financial stability and monetary policy). As for the nominee (omnibus) account, there is no requirement to have zero balance at the end of the day, but only persons, who are authorized to open accounts with the central bank, may have funds in such an account.

Should payment (settlement) accounts be only in the national currency of a given country, or may they also be in foreign currency. As mentioned, according to the Principles of Financial Market Infrastructures, a financial market infrastructure should conduct its money settlements in central bank money where practical and available (Principles for Financial Market Infrastructures, Committee on Payment and Settlement Systems, Bank for International Settlements, Technical Committee of the International Organization of Securities Commissions, 2012). However, the requirement for implementation of final settlement through accounts with the central bank is based on two main reasons:

- the central bank has lower credit risk,
- the central bank is the source of liquidity (the issuer of money).

The emphasis on the second factor indicates that we are talking about the currency issued by the specific central bank.

Best practice study (in particular, the European Union member states, the United Kingdom, South Korea, Singapore) shows that, as a rule, each country's central bank opens payment accounts in the currency issued by itself. Opening foreign currency payment accounts with the central bank not only cannot mitigate liquidity risk, but also creates additional risks for the central bank, since the latter is not the issuer of the foreign currency (Payment, clearing and settlement systems in the CPSS countries, Volumes 1 and 2, Committee on Payment and Settlement Systems, Bank for International Settlements, 2012; Information Disclosure Based on the Principles for Financial Market Infrastructures: The BOJ-NET Funds Transfer System, Bank of Japan, 2025; Payment and Settlement Systems Report, Bank of Korea, 2024).

The account opening policies at the central banks in different countries studied.

The account opening policies at the central banks in different countries studied are presented below.

European Union member states: The payment and securities settlement infrastructure in the European Union is based on TARGET Services, operated by the Eurosystem. The Eurosystem is the body responsible for monetary policy in the

Eurozone, consisting of the European Central Bank and the national central banks of the EU member states. TARGET Services includes the following financial market infrastructures:

- T2 for payment settlements,
- T2S for securities settlements,
- TIPS for instant payment settlements.

The following persons are authorized to open an account in T2:

- credit institutions (banks) established in the territory of the European Union,
- branches of credit institutions (banks), established outside the territory of the European Union, operating in the territory of the European Union.

The central bank may also, at its discretion, open accounts for the following persons:

- for treasuries of governments or local authorities of the member states of the European Union,
- for public sector entities of the member states of the European Union which are authorised to conduct customer accounts,
- for investment firms established in the European Union,
- for branches of investment firms, established outside the European Union, operating in the European Union,
- for operators of payment systems and securities settlement systems.

Two types of accounts are opened in T2: a main cash account and dedicated accounts for settlement in the RTGS, TIPS or T2S.

Main cash accounts are used for:

- centralized liquidity management,
- access to credit lines,
- minimum reserve requirements,
- participation in central bank operations (open market operations, standing facilities),
- cash inflows and outflow transactions (TARGET Services, Annual Report, European Central Bank, 2024).

To perform final settlement in separate payment and securities settlement systems, it is necessary to have dedicated accounts for final settlement in the given systems. Funds are deposited from main cash accounts to payment accounts, after which it is possible to carry out the final settlement in the corresponding system.

As can be seen from the described model, in the EU countries, the accounts intended to meet the reserve requirement and the payment accounts are separated from each other. However, the balance in the payment account at the end of the day is also included in the calculation of the reserve requirement.

The United Kingdom: Reserve accounts with the Bank of England are opened for banks, building societies, central securities depositories (CCPs), international central securities depositories (ICSDs) and investment firms (The Bank of England's Sterling Monetary Framework, Bank of England, 2025). Although reserve accounts and settlement accounts serve different purposes, entities who have reserve accounts may also use these accounts as settlement accounts. When settlement accounts are not also reserve accounts, no interest is accrued on these accounts, and the end-of-day balance is limited to the maximum amount set by the central bank. It is usually set as a small amount, due to the need to ensure monetary policy and financial stability. In fact,

settlement accounts are almost zero-based accounts. It is the account holder's obligation to withdraw funds from the account at the end of each day (to almost zero balance).

Electronic money issuers and payment institutions are not authorized to open reserve accounts with the central bank. Therefore, the latter may only open settlement accounts.

The funds in settlement accounts may only be used for making customers's payments and may not be used for any other purpose.

The advisability of opening a settlement account with the Central Bank is considered from the perspective of mitigating two main types of risks: credit risk of the final settlement agent and risk associated with interruption of operations. When assessing the efficiency of mitigating these risks and cost-effectiveness, the central bank is concerned with the following criteria:

- the volume and number of transactions performed in the payment system. The greater the volume and number of transactions, the greater the risks associated with the operation of the payment system,
- the nature of the transactions carried out through the payment system. This criterion assesses the relative importance of the transactions for the economy and society, regardless of their volume and quantity,
- the authority of participants of the payment system to open settlement accounts with the central bank.

The decision to open a settlement account is under the sole discretion of the central bank. The following entities are authorized to open settlement accounts with the central bank:

- banks or building societies that have reserve accounts with the central bank,
- investment firms that have reserve accounts with the central bank,
- central securities depositories (CCPs) that have reserve accounts with the central bank,
- international central securities depositories (ICSDs), which have reserve accounts with the central bank,
- financial market infrastructure (FMI) operators that do not have reserve accounts with the central bank, but which perform systemically important functions, and the central bank believes that the implementation of final settlement with central bank money may significantly contribute to improving financial stability. The decision to open a settlement account for each system is made at the discretion of the central bank, based on the specifics of that system. These institutions cannot open reserve accounts with the central bank (Bank of England Settlement Accounts, Policy Paper, London, 2021).

In addition to the above, a mandatory condition for opening a settlement account with the central bank is that the potential account holder is a participant in the final settlement of a system whose final settlement is performed by the central bank, and has the operational capabilities to participate in the central bank's RTGS system.

The Bank of England also offers the opening of omnibus (nominee) accounts for payment system operators, so that they can hold their customers' funds in an aggregated form at the central bank. This allows payment system operators to fully settle the wholesale settlement of transactions on their platforms with central bank money. Funds can be held in such accounts both during the business day and after its end (the accounts are not zero-base accounts). Omnibus accounts are also settlement accounts. Omnibus

accounts may be opened only for operators of systemically important payment systems (Bank of England Omnibus Accounts - Access Policy, London, 2021).

Each of these models has a different level of complexity, and therefore also carries a different level of operational risk for the central bank as a settlement service provider and payment and settlement ecosystem provider. Therefore, the use of more complex models, such as those based on omnibus (nominee) accounts, requires more in-depth justifications from the perspective of ensuring financial stability. The choice of model for each specific case is within the competence of the central bank. The choice depends on the results of a thorough analysis of monetary policy and financial stability, as well as operational risks.

South Korea: The cornerstone of the payment and settlement system in South Korea is the BOK-Wire+ system, the South Korean central bank's RTGS system. Members of the system include local banks, branches of foreign banks, investment and insurance companies, the Korea Exchange (KRX) and the Korea Securities Depository (KSD). The system provides for the settlement of wholesale payments between financial institutions, as well as the settlement of net positions of transactions in retail payment systems, securities transactions on the Korea Exchange (KRX) and the Korea Securities Depository (KSD), and foreign exchange transactions.

Institutions that wish to participate in the BOK-Wire+ system must open a current (correspondent) account with the Bank of South Korea. In addition to the existing general current account, the South Korean central bank has introduced a new type of account - the current account for settlement. Depending on the nature of the transaction, the final settlement of the transaction is carried out either through current (correspondent) accounts or current settlement accounts.

Current (correspondent) accounts with the Central Bank of South Korea may only be used for transfers between the Central Bank and participants within the framework of monetary policy and ensuring financial stability, the transfer of the Treasury funds and operations related to the issue and redemption of the government bonds and central bank securities, as well as for transfers between the head office and branches of a given financial institution. In all other cases, the current settlement account is used.

In the BOK-Wire+ system, all transfers between current (correspondent) accounts and current settlement accounts are carried out in the national currency, regardless of the nature of the transfer.

The sole operator of retail payment systems in South Korea is the Korea Financial Telecommunications and Clearings Institute (hereinafter referred to as KFTC). KFTC is the operator of 12 retail payment systems, as well as other financial infrastructure. It calculates the net settlement positions for each retail payment system and transmits them to the Bank of South Korea, which performs the final settlement every day at 11 a.m. in the BOK-Wire+ system. In South Korea, the most widely used retail payments include transfers between bank accounts, card payments and checks. When a payment card is used at a point of sale whose bank account is maintained by a bank other than the bank that issued the payment card, the transactions are settled through the KFTC retail payment system in accordance with the procedure outlined above (Payment and Settlement Systems Report, Bank of Korea, 2024).

Singapore: The Monetary Authority of Singapore (MAS) is the authority responsible for regulating and supervising financial market infrastructure in Singapore. It serves as a

settlement agent for banks operating in Singapore, enabling funds transfers between banks' settlement accounts with MAS. For this purpose, before the start of the operating day, banks transfer the relevant funds from their current account with MAS to the settlement account. If a reserve requirement is set, only the amount exceeding the minimum daily balance can be transferred to the settlement account and used to make payments (Monetary Authority of Singapore (MAS), Annual Report 2024/2025).

Digitalization of payment and settlement operations as a driver of banking system transformation: The ongoing transformation of banking system structures is closely linked to the digitalization of payment and settlement operations. While institutional reforms, such as the expansion of access to central bank accounts, represent the structural dimension of transformation, digitalization constitutes its technological and operational foundation. In practice, the emergence of hybrid and multi-tier banking models would not be feasible without the parallel development of digital settlement infrastructures and payment instruments.

At the core of this transformation lies the modernization of real-time gross settlement (RTGS) systems. Central banks in the European Union (TARGET Services), the United Kingdom (RTGS Renewal Programme), South Korea (BOK-Wire+), and Singapore (MEPS+) have substantially upgraded their settlement platforms to support real-time processing, extended operating hours, interoperability with ancillary systems, and enhanced liquidity management tools. These technological enhancements have reduced settlement risk and increased the feasibility of granting access to central bank money to a broader range of participants, including non-bank financial institutions and financial market infrastructures.

Digitalization has also led to the proliferation of *instant payment systems*, such as TIPS in the European Union and analogous fast payment platforms worldwide. These systems require near-continuous availability of settlement liquidity and rely on automated transfers between reserve accounts and dedicated settlement accounts. As a result, the traditional distinction between reserve-holding accounts and payment accounts has become more operationally significant, reinforcing the need for clearly defined account opening policies at the central bank level.

In parallel, the digitalization of *payment instruments*, including electronic money, mobile wallets, tokenized deposits, and application programming interfaces (APIs) under open banking regimes, has altered the role of traditional bank accounts in the payment process. In many cases, end-users initiate payments through digital instruments without directly interacting with a classical bank account, while final settlement continues to occur in central bank money through accounts held by banks, payment institutions, or system operators. This layered structure further supports the emergence of multi-tier models, where settlement functions are centralized at the central bank, while customer-facing services are provided by a diverse range of intermediaries.

From a regulatory perspective, digitalization increases both *the efficiency and the complexity* of settlement arrangements. Automated liquidity transfers, real-time risk controls, and continuous settlement cycles reduce credit and liquidity risks but simultaneously heighten operational and cyber risks. Consequently, central banks must assess not only the legal status and financial soundness of potential account holders but also their technological capacity to integrate securely with central bank systems. This

consideration is increasingly reflected in access criteria for settlement and omnibus accounts.

Digitalization also reinforces the relevance of *central bank digital currencies (CBDCs)* as a potential extension of existing settlement frameworks. Wholesale CBDC models, in particular, may be viewed as a further evolution of digital settlement accounts, enabling programmable, token-based settlement in central bank money. While CBDCs do not fundamentally alter the two-tier logic of the banking system, they may provide an additional technological layer through which hybrid and multi-tier structures can operate more efficiently.

In this context, digitalization does not eliminate the importance of bank account opening policies; rather, it amplifies their significance. As settlement becomes faster, more automated, and more interconnected, the consequences of inappropriate access to central bank money increase. Therefore, the transformation of banking system architecture must be accompanied by rigorous governance frameworks governing digital settlement access, account types, and permissible uses of funds.

Overall, the digitalization of payment and settlement operations should be regarded as a *functional catalyst* of banking system transformation. It enables the practical implementation of hybrid and multi-tier models while preserving the central role of the central bank as the issuer of risk-free settlement assets and the anchor of monetary stability.

Conclusions

The conducted comparative analysis of the banking systems in various developed and developing economies demonstrates that the transformation of classical two-tier models into hybrid or multi-tier frameworks has become a dominant global trend. While the traditional two-tier banking structure, separating central banks from commercial banks and other depository institutions, remains the conceptual foundation of most modern systems, practical developments have required the integration of new institutional and operational layers. These transformations have been driven primarily by the expansion of financial market infrastructures, technological innovation, and the emergence of systemically important non-bank financial intermediaries.

The experience of the European Union, the United Kingdom, the United States, South Korea and Singapore confirms that central banks increasingly engage directly with financial market infrastructures through the opening of settlement and payment accounts. This diversification of account types, including correspondent, settlement, and nominee (omnibus) accounts, has allowed central banks to balance efficiency, financial stability, and monetary policy transmission. However, it also introduces new regulatory and operational challenges that require consistent governance and clear eligibility criteria for access to central bank accounts.

Despite the advantages of these hybrid and multi-tier arrangements, the classical two-tier structure continues to ensure monetary control, liquidity management and risk containment within the financial system. Therefore, rather than complete replacement, the current stage of evolution should be viewed as a functional diversification of the two-tier model, allowing it to adapt to modern financial realities.

In summary, the transformation of the global banking architecture reflects an adaptive response to the complexity of modern financial ecosystems. The gradual evolution

toward hybrid and multi-tier systems does not undermine the theoretical integrity of the two-tier model but rather reinforces its resilience through innovation and diversification. Ensuring regulatory clarity, operational prudence, and cross-institutional coordination will be key to maintaining financial stability and effective monetary governance in this new environment.

Based on the conducted analysis, the following suggestions have been made:

✓ **Development of Unified Regulatory Principles:** International and national regulatory bodies should develop a standardized framework defining the conditions under which central banks may open and maintain accounts for non-bank institutions. This framework should be aligned with the Principles for Financial Market Infrastructures (PFMI) to ensure consistency and mitigate systemic risk.

✓ **Strengthening Risk Management Mechanisms:** Central banks introducing hybrid or multi-tier account structures must establish robust risk assessment systems to evaluate credit, liquidity, and operational risks associated with granting access to central bank money to non-bank entities.

✓ **Differentiation of Account Types and Functions:** It is advisable to maintain a clear distinction between reserve, payment, and settlement accounts to preserve the effectiveness of monetary policy implementation. Central banks should ensure that the use of each account type corresponds strictly to its intended regulatory and operational purpose.

✓ **Promotion of Technological and Infrastructural Integration:** The introduction of digital payment platforms and potential central bank digital currencies (CBDCs) should be integrated within the evolving multi-tier framework. This will enhance efficiency while ensuring alignment between technological innovation and prudential stability.

✓ **Enhancement of Cross-Border Coordination:** Given the increasing interconnection of global financial systems, international cooperation among central banks is essential to harmonize policies on account opening, settlement arrangements, and oversight of financial market infrastructures.

✓ **Further Research and Monitoring:** Future studies should focus on assessing the long-term impact of hybrid and multi-tier banking models on monetary transmission mechanisms, financial inclusion, and systemic stability. Empirical evaluation of pilot projects (e.g., omnibus accounts and digital settlement models) would provide valuable insights for policy design.

References

Account Access Guidelines, Board of Governors of the Federal Reserve System, available at:

<https://www.federalreserve.gov>

Bank of England Omnibus Accounts - Access Policy, London, 2021, available at:

<https://www.bankofengland.co.uk>

Bank of England Settlement Accounts, Policy Paper, London, 2021, available at:

<https://www.bankofengland.co.uk>

BIS Working Papers, No. 948, Central bank digital currency: the quest for minimally invasive technology, 2021, Available at: <https://www.bis.org>

Central bank digital currencies: foundational principles and core features. Joint report by The Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors of the Federal Reserve and Bank for International Settlements. Available at: <https://www.bis.org/publ/othp33.htm>

- Central Bank Digital Currency Policy-Maker Toolkit**, Insight Report, Centre for the Fourth Industrial Revolution, World Economic Forum, January 2020. Available at: http://www3.weforum.org/docs/WEF_CBDC_Policymaker_Toolkit.pdf
- Considerations and Lessons for the Development and Implementation of Fast Payment Systems**, Part of the World Bank Fast Payments Toolkit, Main Report September 2021, Available at: https://fastpayments.worldbank.org/sites/default/files/202111/Fast%20Payment%20Flagship_Final_Nov%201.pdf
- Directive (EU) 2015/2366** of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32015L2366>
- Directive 2009/110/EC** of the European Parliament and of the Council of 16 September 2009 on the taking up, pursuit and prudential supervision of the business of electronic money institutions amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC, available at: <https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32009L0110>
- Fast Payments, World Bank**: <https://fastpayments.worldbank.org/global-tracker#block-homenav>
- Financial Institutions That Conduct Transactions with the Bank**, Bank of Japan, <https://www.boj.or.jp/en/about/education/oshiete/kess/i08.htm#:~:text=Financial%20institutions%20hold%20current%20accounts,deposits%20from%20individuals%20or%20firms>
- Guidelines for Evaluating Account and Services Requests**, Federal Reserve System, available at: <https://www.federalreserve.gov>
- Guidelines for Evaluating Joint Account Requests**, Federal Reserve System, available at: https://www.federalreserve.gov/paymentsystems/joint_requests.htm
- Korea Financial Telecommunications and Clearings Institute (KFTC)**, <https://www.kftc.or.kr/kftc/main/EgovkftcEnMain.do>
- Monetary Authority of Singapore (MAS)**, <https://www.mas.gov.sg>
- Payment and Settlement Systems Report 2024**, Bank of Korea, available at: <https://www.bok.or.kr/eng/main/main.do>
- Payment, clearing and settlement systems in the CPSS countries**, Volumes 1 and 2, Committee on Payment and Settlement Systems, Bank for International Settlements, available at: <https://www.bis.org>
- Principles for Financial Market Infrastructures**, Committee on Payment and Settlement Systems, Bank for International Settlements, Technical Committee of the International Organization of Securities Commissions, available at: <https://www.bis.org/cpmi/publ/d101.htm>
- TARGET Services**, European Central Bank, Eurosystem, 2024, <https://www.ecb.europa.eu/paym/target/html/index.en.html>
- TARGET Services**, Annual Report, European Central Bank, 2024, 77p., available at: <https://www.ecb.europa.eu/paym/target/html/index.en.html>
- The Bank of England's Sterling Monetary Framework**, available at: <https://www.bankofengland.co.uk/markets/bank-of-england-market-operations-guide/documentation>
- The revised Payment Services Directive (PSD2) and the transition to stronger payments security**, available at: https://www.ecb.europa.eu/paym/intro/mip-online/2018/html/1803_revisedpsd.en.html
- The Role of the Bank of Japan in Payment and Settlement Systems**, available at: https://www.boj.or.jp/en/paym/outline/pay_os/data/set0211a.pdf

IDENTIFICATION AND HARMONIZATION OF MATERIAL VALUES AND PRODUCT NAMES IN A GROUP OF COMPANIES USING NLP METHODS

RAFIK MASHURYAN* 
Yerevan State University

Abstract: The article examines the problem of heterogeneous material-value and product names in a group of companies. The same physical material may be registered under different abbreviations, spellings, languages, internal codes, or incomplete descriptions in the accounting and enterprise systems of separate subsidiaries. This reduces the quality of consolidated reporting, complicates procurement analysis, inventory control, price comparison, and managerial decision-making at the group level. The problem is formulated as an Entity Resolution and product-matching task and is addressed through Natural Language Processing and machine learning methods. A dataset of 17,258 material and product names was annotated manually and used to train a domain-specific Named Entity Recognition model. The proposed pipeline extracts structured components from free-text descriptions and creates a basis for unified material classification, centralized procurement, and analytical control in a group of companies. The article also adds a model-evaluation framework based on the confusion matrix, precision, recall, and F1-score.

Key words: *material classification, data standardization, ERP systems, master data management, entity resolution, named entity recognition, NLP, precision, recall, F1-score*

Introduction

Groups of companies that operate simultaneously in construction, production, and related business areas frequently purchase and use the same or very similar materials, such as cement, rebar, electrical cables, fittings, fasteners, and other inventory items. However, these materials are often recorded differently in local accounting or enterprise-resource-planning systems. A single physical item can appear under different textual descriptions, abbreviations, internal codes, measurement formats, or language variants.

From a management perspective, such heterogeneity prevents the group from answering basic but important questions: how much of a specific material was purchased during a period across all subsidiaries, what part of it was consumed in projects and what part remains in stock, whether there are opportunities for centralized procurement and

* Rafik Mashuryan – PhD Student at the YSU Chair of Mathematical Modeling in Economics
E-mail: rafikmashuryan@gmail.com, ORCID ID: <https://orcid.org/0009-0007-4782-7389>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 12.05.2026

Revised: 19.05.2026

Accepted: 19.06.2026

© The Author(s) 2026

price negotiation, and whether the same item is purchased at materially different prices by different companies.

This article defines the task as the identification and harmonization of material values and product names stored in the data repositories of different companies. The proposed solution is based on NLP and machine learning tools that transform noisy free-text descriptions into structured attributes and support further matching at group level.

Problem Statement and Managerial Motivation

The core problem is the absence of a unified classifier for material values and products. Each company in the group may preserve its own accounting and operational information system, which leads to duplicated and inconsistent representations of the same real-world object. In a construction and production environment, the inconsistencies typically include:

- different abbreviations, for example 'A500C rebar', 'A500 armature', or 'armature 12 mm';
- language and transliteration differences across Armenian, Russian, and English records;
- incomplete or noisy descriptions, for example cement grades or cable descriptions with missing units;
- internal codes that are meaningful inside one subsidiary but are not aligned with codes used by another subsidiary;
- different numerical and measurement formats for diameter, length, voltage, package size, or weight.

From a management perspective, the group needs to answer a number of simple but important questions:

- What is the total quantity of a given material (e.g., M500 cement) purchased over a specific period by all companies?
- What portion of this material has been used in projects, and what portion remains in inventory?
- Are there opportunities for centralized procurement, price negotiations, or standardization of material specifications?
- Comparison of the purchase price of the same material across any two companies, with the aim of optimizing prices and avoiding artificially inflated prices and fraud.

If each company uses its own naming system, answering group-level analytical questions requires manual examination and matching of thousands of material rows. This process is time-consuming, error-prone, and difficult to scale. Therefore, the task can be narrowed to the design of a practical pipeline that integrates with corporate data systems and produces a unified group-level material classifier.

Theoretical Background

The inconsistency of material names is a central issue of Master Data Management (Reddy, 2025). The quality of material master data affects procurement, warehouse management, reporting, and strategic control, especially when data are distributed across several ERP systems. In computer science and data-management literature, this type of problem is usually formulated as Entity Resolution or record linkage. Two entity profiles match if they refer to the same real-world object (Christen, 2012). The probabilistic

foundations of record linkage are commonly traced to the Fellegi-Sunter model, while later ER research extends this logic to modern database, machine learning, and NLP settings (Fellegi & Sunter, 1969; Getoor & Machanavajjhala, 2012).

For a group consisting of n companies, each company C_k maintains a set of material or product records $R_k = \{r_{k1}, r_{k2}, \dots, r_{km}\}$. The research task is to construct a matching function that estimates whether two records from different systems refer to the same real material. If r_i and r_j are two records, the model estimates a similarity function $s(r_i, r_j)$, where larger values indicate a higher probability of equivalence. A binary matching decision is then made by applying a threshold τ : two records are treated as a match when $s(r_i, r_j) \geq \tau$, and as a non-match otherwise.

Threshold selection. In the empirical run reported in Table 5, in the experimental specification, a threshold of $\tau = 0.70$ was used as an illustrative operational threshold. This value was selected on the validation subset as a compromise between avoiding incorrect material merges and preserving a reasonable ability to detect repeated materials. A higher threshold would increase precision but would miss more true matches, while a lower threshold would increase recall but would also merge more descriptions that refer to different specifications.

Similarity aggregation. The final score $s(r_i, r_j)$ was formed as a weighted combination of the extracted components: the core noun received the highest weight because it identifies the material family; adjectives and complements captured type or grade; numerical values and measurement units captured technical specifications; and the remaining normalized text similarity captured minor spelling or transliteration differences. In practical terms, the aggregation can be written as $s = 0.45*s_{\text{noun}} + 0.20*s_{\text{modifier}} + 0.25*s_{\text{number-unit}} + 0.10*s_{\text{text}}$. Numerical-unit mismatches were treated as a strong penalty rather than a minor difference, because materials with similar names but different diameters, voltage, length, weight, or grade usually refer to different inventory items. The use of weighted and learnable string-similarity components is consistent with adaptive duplicate-detection approaches proposed in earlier data-mining research (Bilenko & Mooney, 2003).

Pairwise grouping and non-transitive cases. After pairwise matches are detected, records are grouped through connected components, but the resulting groups are checked for specification consistency. If r_i is similar to r_j and r_i is similar to r_k , while r_j is not similar to r_k , the group is not accepted automatically. Such cases are treated as ambiguous clusters and are either split according to the numerical-unit attributes or sent to manual review. This rule is important for material harmonization because a general name can serve as a bridge between two specific but different materials.

$$r_i \equiv r_j \Leftrightarrow s(r_i, r_j) \geq \tau$$

This formulation is important because it converts a managerial harmonization problem into a measurable task. It also makes it possible to define evaluation criteria such as precision, recall, and F1-score. In large datasets, naive pairwise comparison has quadratic complexity, so blocking or filtering methods may be required to reduce the number of candidate pairs before detailed matching (Papadakis et al., 2020). Duplicate-record detection studies also emphasize that approximate matching requires both suitable similarity metrics and scalable search strategies (Elmagarmid et al., 2007).

Recent research also emphasizes the role of learning-based similarity models in Entity Resolution. Neural approaches can support product matching by learning not only

direct lexical overlap, but also deeper contextual and structural similarities between heterogeneous descriptions (Cicco & Firmani, 2019). In particular, BERT-based similarity learning has shown effectiveness for product-matching tasks, where semantically similar product descriptions may differ in wording, abbreviations, or attribute order (Traçz et al., 2020). More recent entity-matching studies show that deep-learning models are especially useful for textual and dirty entity-matching tasks, while BERT provides contextual bidirectional representations that improve semantic comparison of text descriptions (Mudgal et al., 2018; Devlin et al., 2019).

Natural Language Processing is the set of methods through which computers process and analyze text written in natural language. In groups of companies, much management-relevant data are not available as clean structured tables but as short free-text descriptions, purchase requests, warehouse comments, technical specifications, or product names. NLP therefore acts as an intermediate layer that converts unstructured text into structured features suitable for economic analysis and managerial decision-making.

Named Entity Recognition is one of the fundamental NLP tasks. Its goal is to detect and classify meaningful spans in text (Yadav & Bethard, 2018). In the context of material names, NER can be used to extract the core noun, modifiers, numerical-measurement segments, units, and complementary descriptors. Once these elements are separated, material descriptions become more comparable across different subsidiaries. Neural NER architectures, including character-aware and sequence-labeling models, are particularly relevant when domain-specific entity spans must be learned from annotated examples (Lample et al., 2016).

Data and Methodology

The empirical part of the work applies a Named Entity Recognition approach to material descriptions collected from different companies in the group. A total of 17,258 material-value and product names were collected and manually annotated. The annotations identify the relevant components inside each description, such as nouns, adjectives, numerical values, measurement units, and complements. These annotations form the training data for the neural model.

Data source and sampling. The dataset was compiled from material master data, warehouse, and procurement nomenclature records used by construction and production companies within the group. The sampling unit was the individual material or product name as recorded in the local enterprise or accounting system. The sample included all available non-empty material-name records from the selected corporate databases at the time of extraction; purely technical blank rows, duplicate empty entries, and records without a textual description were removed before annotation. Because the objective was to harmonize operational nomenclature, the dataset intentionally preserved noisy spelling, abbreviations, mixed languages, and inconsistent measurement formats instead of normalizing them manually before training.

For NER implementation, the study uses spaCy, an open-source NLP framework developed in Python (*spaCy Usage Documentation*, n.d.). A blank multilingual model was created and trained directly on the domain corpus of material descriptions. This approach is appropriate for a group of companies because material descriptions may contain several languages or writing systems. The annotations for

each record were converted into spaCy training format: (text, {'entities': [(start_char, end_char, label), ...]}) (*spaCy Usage Documentation*, n.d.). The software implementation is also aligned with the published spaCy system description for industrial-strength NLP workflows (Honnibal et al., 2020).

The model was trained through mini-batch stochastic gradient descent for 100 iterations. Dynamic batch sizes were gradually increased from 4 to 32, dropout was used to reduce overfitting, problematic records were skipped with warnings instead of stopping the training process, and loss values were printed after each iteration to monitor convergence. In Table 2, the sequence of the model training steps is presented.

Table 1. Examples of annotated material descriptions

rebar 8 mm	{'noun': 'rebar', 'unit and numbers': '8 mm'}
rebar 10 mm	{'noun': 'rebar', 'unit and numbers': '10 mm'}
nail 80 mm	{'noun': 'nail', 'adj': '', 'unit and numbers': '80 mm'}
nail 100 mm	{'noun': 'nail', 'adj': '', 'unit and numbers': '100 mm'}
mesh 4 mm 20x20	{'noun': 'mesh', 'adj': '', 'unit and numbers': '4mm 20*20'}
0.4 kV current transformer 1200/5	{'noun': 'current transformer', 'adj': '', 'unit and numbers': ['0,4kv', '1200/5']}
tuff building stone straight cut	{'noun': 'stone', 'adj': 'tuff', 'noun complement': 'straight cut'}
nut 14	{'noun': 'nut', 'adj': '', 'unit and numbers': '14'}
washer 14x30	{'noun': 'washer', 'adj': '', 'unit and numbers': '14x30'}
bolt 14*50	{'noun': 'bolt', 'unit and numbers': '14*50'}

Source: Author's processing based on the manually annotated material-name dataset of 17,258 descriptions.

Table 2. Sequence of model-training steps

<i>Step</i>	<i>Component</i>	<i>Description</i>	<i>Result</i>
1	Data export	Import of material descriptions	Raw text and labels
2	Annotation conversion	Mapping labels to text offsets	spaCy format
3	Validation	Checking token-aligned offsets	Clean dataset
4	Model initialization	Blank multilingual model with NER	Prepared model
5	Label registration	Nouns, adjectives, complements, units, and numerical segments	Complete label set
6	Training	100 iterations, mini-batches, dropout	Trained NER model
7	Evaluation	Confusion matrix, precision, recall, F1-score	Quality indicators
8	Application	Automatic extraction of material-name components	Structured data

Source: the spaCy training pipeline and NER component documentation, as well as general NER model-training methodology (Explosion, n.d.; Honnibal et al., 2020; Yadav & Bethard, 2018; Lample et al., 2016).

Validation strategy. To evaluate generalization rather than memorization, the annotated corpus was divided into training, validation, and test subsets in an 80/10/10 proportion. The training subset was used to fit the NER model, the validation subset was used to monitor convergence and choose the threshold τ , and the hold-out test subset was used only for the final calculation of precision, recall, and F1-score. During the split, records with similar material families were distributed across subsets where possible, so that the test results would reflect performance on unseen descriptions rather than repeated copies of the same text.

Evaluation Framework: Confusion Matrix, Precision, Recall, and F1

After training, model quality must be evaluated. For classification and entity extraction tasks, evaluation is based on a comparison between predicted labels and true labels. The basic instrument is the confusion matrix (Table 3), which describes classification outcomes quantitatively. In a binary interpretation of matching or entity detection, the following quantities are distinguished.

Table 3. Confusion-matrix quantities

TP	True positives; Correctly detected matches or entity spans
FP	False positives; Records or spans incorrectly classified as positive
FN	False negatives; True matches or entity spans missed by the model
TN	True negatives; Correctly rejected non matches or negative cases

Source: the standard confusion-matrix framework for classification evaluation (Sokolova & Lapalme, 2009; Powers, 2011; Christen, 2012).

Precision describes what share of the examples classified as positive by the model are actually correct. It expresses the reliability of positive predictions. High precision means that the number of false positives is small, which is important when incorrect harmonization of two different materials may distort procurement, inventory, or price-comparison decisions (Table 3).

Recall describes what share of all true positive examples were successfully identified by the model. It expresses the detection capability of the model. High recall means that the model misses few real matches or valid entity spans, which is important when undetected duplicates keep the material classifier fragmented (Table 3).

Precision and recall are often in a trade-off relationship. Increasing the decision threshold usually increases precision but reduces recall; lowering the threshold usually increases recall but may reduce precision. Because these two indicators may move in opposite directions, F1-score is used as a combined measure. F1-score is the harmonic mean of precision and recall and penalizes imbalance: if either precision or recall is low, the F1-score also becomes low (Table 4).

Table 4. Evaluation indicators used for the NER and matching task

Precision	$TP / (TP + FP)$; Reliability of positive predictions; lower false-positive risk
Recall	$TP / (TP + FN)$; Ability to find true matches or entity spans; lower false-negative risk
F1 score	$2 * Precision * Recall / (Precision + Recall)$; Balanced combined measure of precision and recall

Source: Standard classification-evaluation measures for precision, recall, and F1-score (Sokolova & Lapalme, 2009; Powers, 2011)

In the context of a group of companies, these indicators are more informative than accuracy alone. Material data are typically imbalanced: the number of non-matching pairs can be much larger than the number of true matches, and accuracy may remain high even when the system misses many important duplicate materials. Precision, recall, and F1-score therefore provide the theoretical basis for evaluating whether the proposed NLP pipeline is suitable for operational harmonization. In our discussed case, the results are presented in Table 5.

Interpretation of the obtained results. The reported precision value of 0.75 means that three quarters of the positive matches or extracted entity spans accepted by the model were correct. The recall value of 0.64 is lower than precision, which indicates that the model was more conservative in accepting matches and missed part of the true positive cases. This is expected in the material-harmonization setting because many descriptions are short, contain different abbreviations, or differ mainly by numerical specifications. The resulting F1-score of 0.69 can therefore be interpreted as satisfactory for an initial applied model, but it also shows that recall should be improved through more annotated examples, better normalization of measurement units, and additional domain-specific rules.

Table 5. Indicators

Indicator	Values
Precision	0.75
Recall	0.64
F1	0.69

Source: Author's calculation on the hold-out test subset of the annotated material-description dataset.

The proposed approach supports the creation of a unified data environment at the group level. Once material names are transformed into structured components and comparable representations, the group can identify repeated materials, standardize descriptions, compare purchase prices across subsidiaries, estimate opportunities for centralized procurement, and improve inventory planning. The same approach can also support internal-process KPIs such as the number of identified materials, the number of unified names, precision, recall, F1-score, the number of incorrect matches, and the potential volume of centralized purchases.

Implementation limitation. The proposed system should be used as a decision-support tool rather than as a fully autonomous replacement for master data governance. High-confidence matches can be standardized automatically, low-confidence non-matches can remain separate, and borderline or non-transitive cases should be reviewed by a responsible data specialist. This mixed workflow reduces manual effort while protecting the company from costly errors caused by incorrectly merging different material specifications.

Conclusion

The article investigated the problem of inconsistent material value and product names in a group of companies as a data management and Entity Resolution task. An NLP-based approach was proposed, combining text preprocessing, Named Entity Recognition, and extraction of structured components from material descriptions. The practical implementation used a manually annotated dataset of 17,258 material and product names and a domain-specific spaCy NER model trained for 100 iterations.

The results and methodological framework show that NLP methods can automate the standardization of material descriptions and create a foundation for further matching and classification. By adding the evaluation framework based on the confusion matrix, precision, recall, and F1-score, the approach becomes measurable and suitable for managerial use. It can serve as a basis for centralized master data management, procurement optimization, inventory control, price comparison, and improved analytical processes in groups of companies.

The main contribution of the study is that it connects a practical managerial problem with a measurable data-science procedure. In groups of companies, material master data are often fragmented across subsidiaries, and this fragmentation directly affects procurement planning, inventory control, price comparison, and the reliability of consolidated reporting. By treating material-name harmonization as a combination of Named Entity Recognition and Entity Resolution, the proposed approach makes it possible to move from manual comparison of thousands of heterogeneous descriptions toward a more systematic and reproducible workflow. The extraction of nouns, modifiers, numbers, units, and complementary attributes creates a structured basis for comparing records that were originally stored as short, noisy, and multilingual text strings.

The empirical indicators also show both the usefulness and the current limitations of the model. A precision value of 0.75 indicates that the model is reasonably reliable when it accepts a match or identifies a relevant entity span, while the recall value of 0.64 shows that a portion of true matches is still missed. This balance is acceptable for an initial applied model because incorrectly merging different material specifications may create higher managerial risk than leaving some potential duplicates for manual review. At the same time, the F1-score of 0.69 confirms that further improvement is necessary before the model can be used as a fully automated component of master data governance.

Future development should therefore focus on expanding the annotated dataset, standardizing measurement units before model training, testing alternative threshold values, and improving similarity aggregation for cases where the same material family has different technical specifications. The proposed pipeline can also be strengthened by adding a manual validation layer for borderline and non-transitive matches. In this form,

the approach can serve as a practical decision-support tool for centralized procurement, inventory optimization, and unified analytical reporting, while still preserving human control over cases where incorrect harmonization may lead to financial or operational errors.

References

- Christen, P. (2012). *Data Matching: Concepts and Techniques for Record Linkage, Entity Resolution, and Duplicate Detection*. Springer.
- Cicco, V., & Firmani, D. (2019). Interpreting deep learning models for entity resolution: An experience report using LIME.
- Papadakis, G., Skoutas, D., & Thanos, E. (2020). *A Survey of Blocking and Filtering Techniques for Entity Resolution*.
- Reddy, A. (2025). An indepth guide to materials master data management. Verdantis. <https://www.verdantis.com/materials-master-data-management>
- Explosion. (n.d.). spaCy usage documentation. Retrieved from <https://spacy.io/usage>
- Trącz, J., et al. (2020). BERT-based similarity learning for product matching. Proceedings of the Workshop on Natural Language Processing in E-Commerce (EComNLP), 66-75.
- Yadav, V., & Bethard, S. (2018). A Survey on Recent Advances in Named Entity Recognition from Deep Learning Models. *Proceedings of COLING*.
- Honnibal, M., Montani, L., Van Landeghem, S., & Boyd, A. (2020). spaCy: Industrial-strength natural language processing in Python. Zenodo. <https://doi.org/10.5281/zenodo.1212303>
- Devlin, J., Chang, M.-W., Lee, K., & Toutanova, K. (2019). BERT: Pre-training of deep bidirectional transformers for language understanding. Proceedings of NAACL-HLT 2019.
- Lample, G., Ballesteros, M., Subramanian, S., Kawakami, K., & Dyer, C. (2016). Neural architectures for named entity recognition. Proceedings of NAACL-HLT 2016.
- Mudgal, S., Li, H., Rekatsinas, T., Doan, A., Park, Y., Krishnan, G., Deep, R., Arcaute, E., & Raghavendra, V. (2018). Deep learning for entity matching: A design space exploration. Proceedings of the 2018 International Conference on Management of Data, 19-34.
- Bilenko, M., & Mooney, R. J. (2003). Adaptive duplicate detection using learnable string similarity measures. Proceedings of the Ninth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 39-48. <https://doi.org/10.1145/956750.956759>
- Getoor, L., & Machanavajjhala, A. (2012). Entity resolution: Theory, practice & open challenges. Proceedings of the VLDB Endowment, 5(12), 2018-2019. <https://doi.org/10.14778/2367502.2367564>
- Elmagarmid, A. K., Ipeirotis, P. G., & Verykios, V. S. (2007). Duplicate record detection: A survey. IEEE Transactions on Knowledge and Data Engineering, 19(1), 1-16. <https://doi.org/10.1109/TKDE.2007.250581>
- Fellegi, I. P., & Sunter, A. B. (1969). A theory for record linkage. Journal of the American Statistical Association, 64(328), 1183-1210. <https://doi.org/10.1080/01621459.1969.10501049>
- Sokolova, M., & Lapalme, G. (2009). A systematic analysis of performance measures for classification tasks. Information Processing & Management, 45(4), 427-437.
- Powers, D. M. W. (2011). Evaluation: From precision, recall and F-measure to ROC, informedness, markedness and correlation. Journal of Machine Learning Technologies, 2(1), 37-63.

EVALUATION OF U.S. TARIFF POLICY AND ITS IMPACT ON IMPORTS IN THE CONTEXT OF GLOBALIZATION

MARIAM VOSKANYAN* , ANNA GRIGORYAN** 
Russian-Armenian (Slavonic) University

Abstract. This study presents a comparative analysis of U.S. tariff policy in 1930 and 2025, focusing on how the macroeconomic transmission of trade shocks has changed as globalization deepened. We propose a Globalization-Augmented Import Adjustment (GAIA) framework, which embeds a globalization coefficient G_{eff} directly into the structural import demand equation. The adjusted estimate suggests that under 2025 tariff rates, total U.S. import contraction may reach approximately 24%, exceeding the Tax Foundation CGE projection (22%), the IMF forecast (20%), and the WTO trade decline estimate (8-10%). A historical comparison with the Smoot-Hawley episode reveals that despite higher nominal rates in the 1930s, the overall import contraction was more limited owing to shallow integration and the dominance of final-goods trade. These findings imply that globalization functions as a structural multiplier of protectionist measures.

Key words: *tariffs, Smoot-Hawley, trade policy, globalization, global value chains (GVCs), KOF index, CGE model, GAIA, protectionism, import elasticity*

1. Introduction

The question of whether protectionist trade policy is economically justified has long occupied both academic economists and policymakers. The wave of tariff measures initiated by the United States administration in 2025 has given this debate renewed urgency: the proposed tariffs are the most comprehensive in scope since the Smoot-Hawley Tariff Act of 1930, which has become the defining symbol of interwar trade policy.

Yet a straightforward comparison of tariff rates across the two periods is insufficient for assessing their economic consequences. The global economy of 2025 differs fundamentally from that of the 1930s in its degree of integration. Trade in intermediate goods within global value chains (GVCs), the share of exports in world GDP, and the density of cross-border production linkages together create a structurally different environment for the transmission of trade shocks.

Existing forecasts from the IMF (2025), WTO (2025), Tax Foundation (2025), and EY-Parthenon (2024) rely on standard CGE models and scenario analysis. A common

* **Mariam Voskanyan** – PhD in Economics, Professor of Economics at RAU, Head of the Chair of Economics and Finance, RAU

Email: mariam.voskanan@rau.am, ORCID ID: <https://orcid.org/0000-0002-5417-6648>

** **Anna Grigoryan** – PhD Student at the Chair of Economics and Finance, RAU

Email: anna.grigoryan1@student.rau.am, ORCID ID: <https://orcid.org/0009-0006-0561-9138>



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Received: 11.05.2026

Revised: 27.05.2026

Accepted: 19.06.2026

© The Author(s) 2026

limitation is that they do not explicitly model the structural shift in trade sensitivity attributable to the manifold increase in globalization relative to the historical baseline period. While standard CGE models capture behavioral responses and current elasticities, they treat the degree of global economic integration as a fixed parameter rather than a structural amplifier that changes over time.

This paper pursues two objectives. First, it proposes the GAIA (Globalization-Augmented Import Adjustment) framework, which explicitly incorporates a time-varying globalization coefficient into the structural import demand equation. Second, it applies this framework to quantify how the increase in globalization since 1990 amplifies the trade contraction effects of the 2025 U.S. tariffs relative to the Smoot-Hawley episode, providing a structural explanation for why equal nominal tariff rates produce substantially different economic outcomes across historical periods.

The paper is organized as follows. Section 2 reviews the theoretical and empirical literature on tariff effects and the role of GVCs in amplifying trade shocks. Section 3 describes the methodology and the GAIA model. Section 4 presents the results. Section 5 provides the conclusion and discussion.

2. Literature Review

Most economists agree that protectionism generates negative consequences for economic growth and welfare. The central mechanism is the concept of deadweight loss: tariffs distort price signals and inefficiently reallocate resources from more productive uses to less efficient, protected industries. Irwin (2002) confirms through empirical analysis of historical tariff episodes that protectionism does not generate durable comparative advantages.

The Infant Industry Argument holds that nascent industries may require temporary protection to achieve economies of scale. However, Melitz (2005) indicates that such protection tends to entrench inefficiency. Optimal Tariff Theory holds that a large economy could theoretically improve its terms of trade through an optimal tariff, but Bagwell and Staiger (1999) demonstrate that retaliatory measures typically eliminate the potential gains.

It is also argued that tariffs can correct market failures or respond to unfair trading practices such as dumping (Dixit, 1983; Grossman, 1986; Krugman, 1986). Nevertheless, Greenwald and Stiglitz (1986) show that tariffs represent an inefficient instrument for correcting domestic market failures. Autor, Dorn, and Hanson (2013) demonstrate that employment gains in protected sectors are typically offset by losses in export-oriented industries. Furceri, Hannan, Ostry, and Rose (2018) question the effect of tariffs on the trade balance.

Amiti, Redding, and Weinstein (2019) showed that the 2018 tariffs were fully passed through to U.S. consumers with no reduction in world prices. Levy, Singhal, and Fox (2025) documented systemic supply chain disruptions resulting from tariff measures.

A growing strand of literature focuses specifically on how GVC participation transforms the transmission mechanism of trade policy shocks. Baldwin (2012) argues that the "second unbundling" of globalization creates a qualitatively different trade structure in which intermediate inputs cross multiple borders before final assembly, causing tariff costs to accumulate along the chain. Antras (2020) demonstrates that GVC participation raises the effective trade cost exposure of domestic firms beyond what

bilateral tariff rates suggest. These findings provide the theoretical foundation for why a globalization coefficient should amplify the baseline import contraction estimate.

The historical episode most closely analogous to the 2025 tariff wave is the Smoot-Hawley Tariff Act of 1930. Irwin (2011) establishes that the direct effect of the tariff on import volumes was relatively modest, with the bulk of the Great Depression's trade collapse attributable to income effects and retaliation rather than the tariff mechanics themselves. This finding is central to the present paper's comparative framework.

Despite this extensive literature, most existing forecasting models are calibrated on current elasticities and do not explicitly model the structural shift in trade sensitivity attributable to the increase in globalization relative to the pre-WWII baseline. The GAIA framework proposed in this paper addresses this gap.

Among political rationales for protectionism, the reduction of trade deficits and stimulation of employment are most frequently invoked. The empirical record does not support these claims: Autor, Dorn, and Hanson (2013) demonstrate that gains in protected sectors are typically offset by losses in export-oriented industries and sectors dependent on imported inputs. Furceri, Hannan, Ostry, and Rose (2018) find that tariff increases are associated with lower output and higher unemployment in the medium term, with the contractionary effects persisting for several years. These findings are consistent with the GAIA framework's implication that the aggregate economic impact of tariffs is larger in highly integrated economies than standard single-stage models suggest.

3. Methodology

The methodology combines comparative-historical analysis with a modified structural approach. Two key episodes of U.S. protectionist policy are compared: the Smoot-Hawley Tariff of 1930 and the tariff measures of 2025.

The comparative-historical method is particularly well-suited to the research question at hand. By holding the tariff instrument constant - examining two episodes characterized by broadly similar tariff rate levels - and varying the structural context (the degree of global economic integration), it is possible to isolate the amplification effect of globalization from other determinants of trade contraction. This quasi-experimental logic is central to the paper's identification strategy: the Smoot-Hawley episode serves as a counterfactual baseline in which the same instrument was applied to a world with fundamentally shallower integration.

The choice of 1930 and 2025 as comparison points is substantively motivated. Both episodes involve the United States - the world's largest import market - imposing broad-based tariff increases that triggered retaliatory responses from major trading partners. Both occurred during periods of elevated economic uncertainty. The key structural difference is the intervening transformation of global trade architecture: from a world dominated by bilateral flows of final goods and primary commodities to one organized around multilayered GVC networks in which intermediate inputs cross borders multiple times before reaching consumers.

3.1 Baseline import demand equation

In the standard General Equilibrium Model (GEM), the relative change in import volume in response to a tariff is:

$$\frac{\Delta M}{M} = -\varepsilon \frac{t}{1+t} \quad (1)$$

where $\frac{\Delta M}{M}$ is a relative change in import volume, ε - price elasticity of import demand ($\varepsilon = 3$, following Tax Foundation, 2025) and t - tariff rate as a decimal fraction.

This specification assumes that the structural sensitivity of the economy to trade shocks remains constant regardless of the degree of global integration.

3.2 The GAIA framework and its distinction from standard CGE

The GAIA framework introduces G_{eff} as a time-varying structural amplifier. While a standard CGE model produces equation (1), the GAIA framework produces:

$$\left(\frac{\Delta M}{M}\right)^* = \left(\frac{\Delta M}{M}\right) * G_{\text{eff}} \quad (2)$$

where G_{eff} is a globalization amplification coefficient ($G_{\text{eff}} \geq 1$); all other variables as in equation (1).

The key distinction is that standard CGE models implicitly assume $G_{\text{eff}} = 1$. The GAIA framework relaxes this assumption by scaling the baseline estimate upward to reflect the fact that a given tariff rate generates larger cascade effects in a deeply integrated GVC-based economy. In modern supply chains, a tariff compounds at each border crossing, amplifying the effective cost shock throughout the production network.

3.3 Calculation of G_{eff}

The coefficient G_{eff} captures the smoothed relative growth in global integration between a reference period and the present. The KOF Globalization Index (ETH Zurich) is available from 1970 onwards; no data exist for 1930. The year 1990 is used as the baseline, representing the onset of modern GVC formation following the end of the Cold War and the integration of China and Eastern Europe into global supply chains (Baldwin, 2012). According to KOF data (Gygli, Haelg, Potrafke, and Sturm, 2019), the index of economic globalization rose from $KOF_{1990} = 59$ to $KOF_{2025} = 88$, an increase of approximately 1.5-fold. The empirical exchange-rate pass-through literature consistently reports short-run transmission coefficients of 0.2-0.4 (Campa and Goldberg, 2005). By analogy, a power-smoothing transformation from the Box-Cox family (Box and Cox, 1964) is applied:

$$G_{\text{eff}} = 1 + \lambda * (G^* - 1) = 1 + \lambda * \left(\frac{KOF_{2025}}{KOF_{1990}} - 1\right) \quad (3)$$

where λ is a smoothing parameter (0.2 at central estimate); $\frac{KOF_{2025}}{KOF_{1990}} = 88/59 = 1.49$ (KOF Globalization Index, ETH Zurich, 2024).

At the central conservative value $\lambda = 0.2$:

$$G_{\text{eff}} = 1 + 0.2 * (7.5 - 1) = 1.099 \quad (4)$$

3.4 Justification of $\lambda = 0.2$

The value of 0.2 is chosen as the lower bound of the pass-through range established in the literature (Campa and Goldberg, 2005; Frankel and Rose, 1998), yielding a conservative estimate. Robustness is verified through a sensitivity analysis (Table 1).

It is important to note what λ captures conceptually and what it does not. It does not represent a direct estimate of GVC pass-through derived from trade data: such an estimate would require product-level data on supply chain depth and tariff incidence across stages, which is beyond the scope of this paper. Rather, λ is a calibrated parameter that translates the observed increase in globalization as measured by the KOF index into a proportional amplification of the import demand response. The use of the exchange-rate pass-through range as a reference point (Campa and Goldberg, 2005;

Frankel and Rose, 1998) is an analogy motivated by the common underlying mechanism: in both cases, an external price shock is only partially transmitted into domestic economic outcomes due to market adaptation, contractual rigidities, and substitution effects. The conservative choice of $\lambda = 0.2$ ensures that the GAIA estimate errs on the side of understatement rather than overstatement.

Table 1. Sensitivity analysis with respect to λ ¹

λ	G_eff	Adjusted import decline
0.10	1.049	~23.1%
0.15	1.074	~23.6%
0.20 (central)	1.099	~24.2%
0.25	1.123	~24.7%
0.30	1.147	~25.2%

For any value of λ in the range 0.10-0.30, the adjusted estimate robustly exceeds the Tax Foundation baseline (22%) and falls within 23-25%.

3.5 Data sources and time periods

The study draws on: (i) KOF Globalization Index (ETH Zurich, 2024; Gygli et al., 2019) - observations for 1990 and 2025, index available from 1970 onwards; (ii) Tax Foundation (2025) CGE modelling results as the baseline forecast; (iii) historical U.S. trade data from the US Department of Commerce (1975), digitized by the Federal Reserve Bank of St. Louis - annual series 1929-1940; (iv) Our World in Data (n.d.) and Federico and Tena-Junquera (2019) on the dynamics of world trade - 1920-2014; (v) World Bank World Development Indicators (2024) for post-2014 trade-to-GDP ratios.

4. Results

4.1 The Smoot-Hawley Tariff: historical analysis

The Smoot-Hawley Tariff Act, signed on June 17, 1930, is one of the most studied examples of protectionist policy in U.S. history. It was enacted against the backdrop of the early Great Depression and preceded by a prolonged crisis in U.S. agriculture. The United States already maintained high tariffs under the Fordney-McCumber Act of 1922. Despite rising imports of manufactured goods, the U.S. retained a positive trade balance, which undermined the argument that protection was necessary.

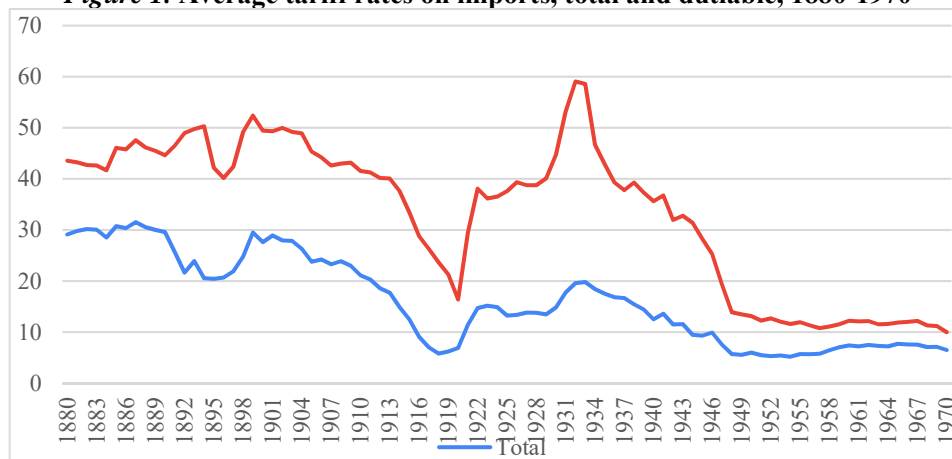
The bill was substantially broadened through industrial lobbying and logrolling, ultimately raising tariffs on more than 20,000 import categories. Notably, 1,028 economists signed a petition against the bill.

The average tariff rate on dutiable imports rose from approximately 40% in 1929 to 47% in 1930. A key driver of further increases was deflation: roughly two-thirds of imported goods were subject to specific (fixed) duties. Import prices fell by 18% in 1930, 22% in 1931, and another 22% in 1932, nearly 49% relative to 1929. As a result, the

¹ All values follow directly from equation (3): $G_{eff} = 1 + \lambda * (G^* - 1)$. The adjusted estimate is $0.22 * G_{eff}$, where 0.22 is the Tax Foundation (2025) CGE baseline.

average tariff on dutiable imports automatically rose to 53% in 1931 and 59% in 1932 (US Department of Commerce, 1975).

Figure 1. Average tariff rates on imports, total and dutiable, 1880-1970

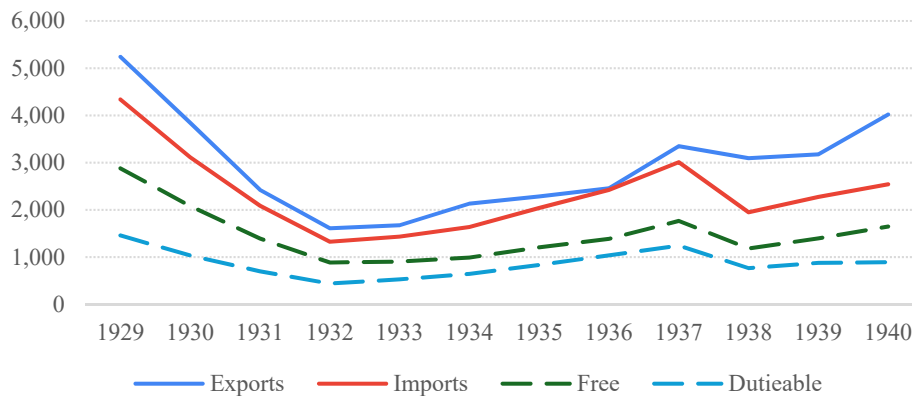


Source: US Department of Commerce (1975), series U-211-12, seen 08.01.2026

The act itself raised the average rate on dutiable goods by approximately six percentage points. Two factors limit its direct effect. First, the 15% price increase on dutiable imports implied only approximately 4% increase in consumer prices. Second, one-third of imports were already dutiable in 1929; the new act covered the remaining two-thirds, mainly raw materials (silk, coffee, rubber). Treating duty-free imports as a control group, the law reduced dutiable imports by approximately 20%, implying approximately 7% reduction in total imports.

Between 1929 and 1932, the value of U.S. exports and imports fell by nearly 70%, partly due to falling prices. In volume terms, exports declined by 49% and imports by 40%, a steeper fall than the 25% decline in real GDP.

Figure 2. U.S. exports and imports, 1929-1940, USD million



Source: US Department of Commerce (1975), seen 08.01.2026

The Smoot-Hawley Act triggered retaliatory measures from Canada, the United Kingdom, France, Germany, and others. World trade values contracted by approximately 60% by 1934. Real U.S. GDP fell approximately 45.7% between 1929 and 1933; world GDP contracted by an estimated 15% over five years (Grossman and Meissner, 2010). Most research concludes that the direct effect of the tariff itself was modest relative to the Great Depression overall: Bond, Crucini, Potter, and Rodrigue (2012) estimate a decline in TFP of approximately 0.5%. Unemployment rose from 3.2% in 1929 to 24.9% in 1933.

4.2 U.S. tariff policy in 2025

U.S. trade policy in 2025 is characterized by a comprehensive tariff system with high rates and significant uncertainty. The main components are:

- **Universal baseline tariff:** approximately 10% on imports from most countries.
- **"Reciprocal" tariffs:** individualized rates for more than 50 countries. Implementation was suspended for 90 days in April 2025, except for China.

Table 2. U.S. tariffs on major trading partners, September 2025

Country	Tariff Rate	Taxable Import Volume (USD bn)
EU	15%	\$319.76
China	30%	\$266.53
Canada	35%	\$256.10
Mexico	25%	\$255.20
Vietnam	20%	\$89.54
Japan	15%	\$73.37
India	50%	\$54.11
South Korea	15%	\$47.07
Thailand	19%	\$35.60
Taiwan	20%	\$31.99
Malaysia	19%	\$25.42
Switzerland	39%	\$25.40
Indonesia	19%	\$23.61
Brazil	50%	\$6.61

Source: Tax Foundation (2025), seen 25.09.2025

The White House published a methodology for calculating reciprocal duties (US Trade Representative, n.d.):

$$\Delta \tau_i = \frac{x_i - m_i}{\varepsilon * \varphi * m_i} \quad (5).$$

where $\Delta \tau_i$ - reciprocal tariff for country i , x_i - U.S. exports to country i , m_i - U.S. imports from country i , ε - price elasticity of import demand (set at 4); φ - elasticity of import prices with respect to tariffs (set at 0.25).

Since $\varepsilon * \varphi = 4 * 0.25 = 1$, the elasticity factor cancels out, reducing the tariff to the ratio of the bilateral trade deficit to import volume, a methodology widely criticized as economically unfounded.

According to Tax Foundation (2025) calculations, the trade-weighted average applied tariff on all imports will rise to 19%, the highest since 1943, though well below the Great Depression peak of 59% in 1932.

The 19% trade-weighted average represents a significant structural shift in U.S. trade policy, but its economic impact is not uniform across sectors. Intermediate goods - components, semiconductors, industrial machinery, pharmaceutical inputs - face the same statutory rates as final consumer goods, yet their tariff burden compounds across production stages. A 19% tariff on a component that crosses the U.S. border twice before final assembly effectively generates a higher real cost increase than the nominal rate suggests. This sectoral heterogeneity is one of the mechanisms through which the GAIA framework captures additional impact beyond standard CGE projections.

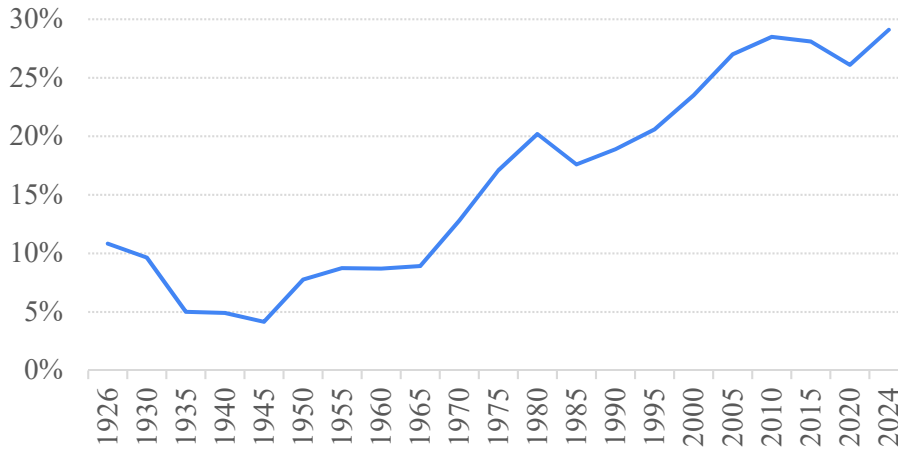
The economic rationale underlying the reciprocal tariff methodology also deserves scrutiny. By setting tariff rates equal to the bilateral trade deficit divided by import volume - effectively treating the entire trade deficit as a tariff-equivalent distortion - the White House methodology conflates different economic phenomena: comparative advantage, domestic savings-investment imbalances, exchange rate dynamics, and supply chain relationships. Most mainstream economists have criticized this approach as theoretically unfounded (Bagwell and Staiger, 1999). Nevertheless, these tariffs are legally in force and their economic consequences must be assessed regardless of their methodological basis, which is precisely the objective of the GAIA framework.

4.3 Globalization dynamics: a comparison across periods

Recent decades have witnessed unprecedented growth in global economic integration (Figure 3). The world export share of GDP reached 29.1% in 2024, nearly six times the level recorded in 1935 (5.0%) and three times the 1930 level (9.6%), which had already begun to decline under the impact of the Smoot-Hawley tariffs and the Great Depression. The lowest point of the entire series was 4.2% in 1945. After sustained growth through the postwar period, the ratio peaked at 28.5% in 2010, declined to 26.1% in 2020 during the COVID-19 pandemic, and recovered to a new high of 29.1% by 2024. In the 1930s this figure did not exceed 10%, and following the Depression it collapsed to below 5%, underscoring the structural gulf between the two periods being compared in this paper.

The growth in trade intensity was underpinned by a sharp reduction in transport and communication costs, which made cross-border fragmentation of production economically viable and drove the formation of modern GVCs (Baldwin, 2012).

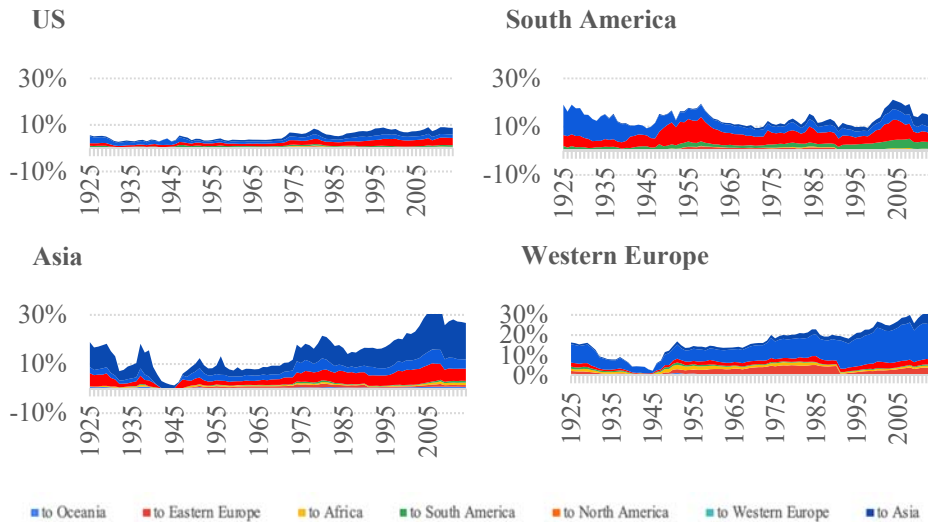
Figure 3. World export share of GDP, %, 1925-2024



Source: Our World in Data (1926-1969), seen 05.08.2025
World Bank (1970-2024) seen 03.06.2026

While 1930s trade consisted predominantly of final goods and raw materials with production chains rarely crossing more than one border, today intermediate goods cross borders multiple times before final assembly (Figure 4). This structural difference is critical: in the 1930s, tariffs acted primarily on the prices of final imported goods, while today the same tariff accumulates at each border crossing within a production chain. This is the mechanism that G_{eff} captures.

Figure 4. Regional export geography, % of world exports, 1925-2014



Source: Our World in Data (1926-1969), seen 05.08.2025

4.4 Adjusted estimate: the GAIA model

The baseline is taken from Tax Foundation (2025) CGE modelling: at an average tariff rate of approximately 19%, the expected decline in imports is 22%. This model, like other standard CGE approaches, does not account for the structural change in trade sensitivity attributable to the increase in globalization, treating G_{eff} as implicitly equal to 1.

Applying the GAIA framework (equation 2):

$$\left(\frac{\Delta M}{M}\right)^* = \left(\frac{\Delta M}{M}\right)_{base} * G_{eff} = 1.099 * 0.22 = 0.24 \quad (6)$$

The adjusted central estimate is approximately 24%, exceeding the baseline by 2 percentage points. Across $\lambda = 0.10$ to 0.30 , the estimate robustly falls between 23% and 25% (Table 1).

The comparison with Smoot-Hawley is instructive: the direct tariff effect then amounted to approximately 7% of total imports, despite considerably higher nominal rates. The gap is explained not by differences in tariff levels but by the fundamentally different architecture of world trade.

To appreciate the significance of the 2-percentage-point difference between the GAIA estimate (24%) and the Tax Foundation baseline (22%), it is useful to consider both the absolute magnitude and the structural mechanism. At 2024 U.S. goods import levels of approximately \$3.1 trillion (US Census Bureau, 2025), a 2-percentage-point increment translates into approximately \$62 billion in additional import reduction relative to standard projections. This is not a marginal correction: it represents a sum larger than the entire goods trade of many mid-sized economies and reflects the systematic underestimation that results from ignoring the structural amplification role of GVC integration.

The structural mechanism behind this difference is also substantively important. Standard CGE models treat the import demand response as a single-stage phenomenon: a tariff raises the price of imported goods, demand falls in proportion to the price elasticity, and the exercise is complete. The GAIA framework recognizes that in a GVC-intensive economy, the same tariff operates at multiple stages of the production chain simultaneously. A tariff on imported steel raises costs for automotive manufacturers who use steel as an input; those manufacturers in turn face higher domestic production costs, which feeds back into the prices of downstream products and reduces overall competitiveness. This cascade logic, captured parsimoniously by G_{eff} , is absent from models that treat the bilateral tariff rate as the final word on trade cost transmission.

5. Conclusion and Discussion

This paper has proposed the GAIA framework and applied it to the 2025 U.S. tariff wave. The comparative-historical analysis demonstrates that, despite higher nominal rates under Smoot-Hawley, the direct impact on U.S. imports (approximately 7%) was considerably more limited than the expected effect of the 2025 tariffs (approximately 24%). The key explanatory factor is the fundamentally different architecture of world trade: in 2025, deeply integrated GVCs cause tariff costs to accumulate multiplicatively along production chains rather than acting as a one-time price shock on final goods.

Unlike standard CGE models that treat the degree of global integration as a fixed structural parameter implicitly equal to 1, GAIA introduces a time-varying coefficient G_{eff} that scales the baseline import response to reflect the historical depth of globalization. The framework is theoretically grounded in the GVC literature (Baldwin,

2012; Antras, 2020) and empirically motivated by the exchange-rate pass-through literature.

Table 3. Summary of forecasts of U.S. tariff impact on the economy, 2025

Source	Economic indicators	Methodology	Globalization accounted for
IMF (April 2025)	World: GDP -2.8%, Trade -4.9%; US: GDP -1.8%, Trade ~-20%	Global growth macro-model with policy shocks	No
EY-Parthenon (Dec. 2024)	US: GDP -1.2 pp; World: GDP -0.5-0.9 pp, Trade ~-6%	Scenario analysis, Oxford Global Economic Model	Limited GVC elasticities
Tax Foundation (Sept. 2025)	US: GDP -0.8%; Imports - \$745bn (-22%)	CGE model with agent behaviour	Elasticities modelled; GVC structure not explicit
WTO (Oct. 2025)	World: GDP -2.1%; Trade -8-10%	Consumer response and trade shock analysis	No formal trade model
GAIA (this study, 2025)	US imports ~-24%	G_eff in structural import equation	Yes

Source: IMF (2025); EY-Parthenon (2024); Tax Foundation (2025); WTO (2025); authors' calculations, seen 10.10.2025

None of the models surveyed explicitly accounts for the structural effect of globalization on trade sensitivity. The adjusted GAIA estimate (approximately 24%) exceeds the Tax Foundation CGE projection (22%) by 2 percentage points. To quantify this difference: total U.S. goods imports in 2024 amounted to approximately \$3.1 trillion (US Census Bureau, 2025), yielding an additional import reduction of $0.02 * \$3.1$ trillion, approximately \$62 billion relative to the standard forecast. It should be noted that this figure represents goods imports only; if goods and services imports (approximately \$4.1 trillion in 2024) are used as the base, the additional reduction would be approximately \$82 billion.

Model limitations. The parameter $\lambda = 0.2$ is a conservative lower bound; higher values within the empirically justified range yield estimates of 23.1-25.2%. The model does not simulate dynamic retaliatory responses of trading partners, which could substantially amplify the final effect. KOF data carry a temporal lag. The GAIA framework represents a partial structural correction to an existing CGE model rather than a full structural model with explicit GVC participation.

Policy implications. Tariff impact assessments based solely on standard CGE models are likely to underestimate import contraction in highly globalized economies. Modern protectionist measures are structurally more disruptive per percentage point of tariff than their historical counterparts, requiring policymakers to account for the depth of GVC integration when calibrating tariff levels.

Future research directions include development of a full structural CGE model with explicit GVC participation; empirical calibration of lambda using panel data on intermediate goods trade; extension of the GAIA framework to third countries affected by U.S. tariff measures through supply chain contagion.

References

- Amiti, M., Redding, S. J., & Weinstein, D. E. (2019). The impact of the 2018 tariffs on prices and welfare. *Journal of Economic Perspectives*, 33(4), 187-210. <https://doi.org/10.1257/jep.33.4.187>
- Antras, P. (2020). Conceptual aspects of global value chains. *Economic Review*, 34(3), 551-574. <https://doi.org/10.1093/wber/lhaa006>
- Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, 103(6), 2121-2168. <https://doi.org/10.1257/aer.103.6.2121>
- Bagwell, K., & Staiger, R. W. (1999). An economic theory of GATT. *American Economic Review*, 89(1), 215-248. <https://doi.org/10.1257/aer.89.1.215>
- Baldwin, R. (2012). Trade and industrialisation after globalisation's 2nd unbundling: How building and joining a supply chain are different and why it matters (NBER Working Paper No. 17716). National Bureau of Economic Research. <https://doi.org/10.3386/w17716>
- Bond, E. W., Crucini, M. J., Potter, T., & Rodrigue, J. (2012). Misallocation and productivity effects of the Smoot-Hawley tariff (NBER Working Paper No. 18034). National Bureau of Economic Research. <https://doi.org/10.3386/w18034>
- Box, G. E. P., & Cox, D. R. (1964). An analysis of transformations. *Journal of the Royal Statistical Society, Series B*, 26(2), 211-252.
- Campa, J. M., & Goldberg, L. S. (2005). Exchange rate pass-through into import prices. *Review of Economics and Statistics*, 87(4), 679-690. <https://doi.org/10.1162/003465305775098189>
- Dixit, A. (1983). International trade policy for oligopolistic industries. *The Economic Journal*, 94, 1-16.
- EY-Parthenon. (2024). Trump's tariffs playbook. https://www.ey.com/en_us/insights/strategy/macroeconomics/trumps-tariff-playbook
- Federico, G., & Tena-Junquera, A. (2019). A tale of two globalizations: Gains from trade and openness 1800-2010. *Review of World Economics*, 155(3), 601-626. <https://doi.org/10.1007/s10290-019-00347-2>
- Frankel, J. A., & Rose, A. K. (1998). The endogeneity of the optimum currency area criteria. *The Economic Journal*, 108(449), 1009-1025. <https://doi.org/10.1111/1468-0297.00327>
- Furceri, D., Hannan, S. A., Ostry, J. D., & Rose, A. K. (2018). Macroeconomic consequences of tariffs (NBER Working Paper No. 25402). National Bureau of Economic Research. <https://doi.org/10.3386/w25402>
- Greenwald, B. C., & Stiglitz, J. E. (1986). Externalities in economies with imperfect information and incomplete markets. *Quarterly Journal of Economics*, 101, 229-264.
- Grossman, G. (1986). Strategic export promotion: A critique. In P. Krugman (Ed.), *Strategic trade policy and the new international economics*. MIT Press.
- Grossman, R. S., & Meissner, C. M. (2010). International aspects of the Great Depression and the crisis of 2007: Similarities, differences, and lessons (NBER Working Paper No. 16269). National Bureau of Economic Research. <https://doi.org/10.3386/w16269>
- Gygli, S., Haelg, F., Potrafke, N., & Sturm, J.-E. (2019). The KOF Globalization Index revisited. *Review of International Organizations*, 14(3), 543-574. <https://doi.org/10.1007/s11558-019-09344-2>
- IMF. (2025). World economic outlook: A critical juncture amid policy shifts. International Monetary Fund. <https://www.imf.org/en/Publications/WEO/Issues/2025/04/22/world-economic-outlook-april-2025>
- Irwin, D. A. (2002). Interpreting the tariff-growth correlation of the late 19th century. *American Economic Review*, 92(2), 165-169. <https://doi.org/10.1257/000282802320191642>
- Irwin, D. A. (2011). *Peddling protectionism: Smoot-Hawley and the Great Depression*. Princeton University Press.

- Krugman, P. (1986). *Strategic trade policy and the new international economics*. MIT Press.
- Levy, C., Singhal, S., & Fox, Z. (2025). *Tariffs and global trade: The economic impact on business*. McKinsey & Company.
- Melitz, M. J. (2005). When and how should infant industries be protected? *Journal of International Economics*, 66(1), 177-196. <https://doi.org/10.1016/j.jinteco.2004.07.001>
- Our World in Data. (n.d.). Trade and globalization. <https://ourworldindata.org/trade-and-globalization> (Accessed August 5, 2025)
- Tax Foundation. (2025). Trump tariffs: The economic impact of the Trump trade war. <https://taxfoundation.org/research/all/federal/trump-tariffs-trade-war/>
- US Census Bureau. (2025). U.S. international trade in goods and services, annual 2024. <https://www.census.gov/foreign-trade/statistics/highlights/annual.html>
- US Department of Commerce. (1975). *Foreign commerce (Series U 187-352)*. Digitized by Federal Reserve Bank of St. Louis. https://fraser.stlouisfed.org/files/docs/publications/histstatus/pages/1975-1979/58477_1975-1979.pdf
- US Trade Representative. (n.d.). Reciprocal tariff calculations. https://ustr.gov/sites/default/files/files/Issue_Areas/Presidential%20Tariff%20Action/Reciprocal%20Tariff%20Calculations.pdf
- World Bank. (2024). World development indicators. <https://databank.worldbank.org/source/world-development-indicators>
- WTO. (2025). *Global trade outlook and statistics, October 2025*. https://www.wto.org/english/news_e/news25_e/stat_07oct25_e.pdf

About the Publishing House of Yerevan State University

The Publishing House of Yerevan State University works closely with the academic community to publish high quality academic journals, monographs and textbooks, and provides services to promote teaching and research. Our main mission is to internationalize, make open, accessible and transparent the scientific work of the Armenian scientific community.

Our publications include digital, print and open access content spanning the humanities and social sciences, natural sciences and technology. In cooperation with authors, we distribute the best academic materials in the region and in the world.

Publish your journal and book with The Publishing House of Yerevan State University and you will join the scientific community of distinguished authors whose published work has helped shape and influence learning in the region and around the world.

- If you need information on how to apply to publish a book, you can read our guide [here](#).
- For information on how to write for a scientific journal, please visit our journal author page [here](#).

Open research

As a university press and not-for-profit publisher, we are committed to the advancement of open research, exploring and innovating new models that will ensure sustainability and quality, while maximising the benefits that openness can offer.

Author Services

In order to continue to publish the best local, regional and international researchers, it is important that we support researchers preparing their research for publication in our journals. In order to help prospective authors to prepare for submission and to reach their publication goals, we offer a range of high-quality manuscript preparation services - including language editing and video abstract creation.

Director of the Publishing House of Yerevan State University is Dr. Karen Grigoryan.
E-mail: publishing@ysu.am



Address: 52a, Kh. Abovyan str., Yerevan

journals.y-su.am
Email: ephbanber@ysu.am
banber.econom@gmail.com

Publishing Editor and Issued by
Proofreader
Technical Editor

Armen Hovakimyan
Gayane Grigoryan
Ani Khalatyan