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Eurasian Journal of Gender Studies (EJGS) *is a double-blind peer-reviewed publication dedicated to disseminating scientific research on gender issues. These issues encompass a range of topics including encouraging the submission of original research, theoretical frameworks, and review articles that explore gender intersections with cultural, social, economic, and political contexts in the Eurasian region.*

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Gender-Inclusive Smart Cities: A Systematic Review, Case Studies and Practical Recommendations

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Abstract

Today, urbanisation is changing the face of cities, making them smarter. However, smart cities often overlook gender equality. This paper aims to explore the links between the implementation of smart city strategies and gender equality indicators, as well as to analyse the consequences of underestimating the importance of this aspect during city planning. This study conducted an interdisciplinary analysis of 25 academic publications and official reports (ITU, UN Women, UN-Habitat), which includes thematic coding, comparative analysis of regional indicators, and visualisation of statistics. The source data consisted of ITU statistics on the digital gender gap (2019–2024) and case studies of four cities: Barcelona, Amsterdam, Seoul, and Dhaka/Chennai. The results show that the global gender parity index for internet access has increased from 0.91 to 0.94, and the gap in the number of users has narrowed from 277 million to 189 million, but in the least developed countries, the indicator has declined (from 0.74 to 0.70). Case studies demonstrate that a combination of physical infrastructure (safe lighting, inclusive transportation) and digital solutions (mobile applications, gender-disaggregated data) improves women's safety and mobility. The analysis identified barriers such as the digital divide, algorithmic bias, surveillance risks, and lack of women's participation in planning. The discussion highlights the issues of algorithmic bias and surveillance, underscores the importance of women's participation in planning, and provides recommendations for the development of truly inclusive smart cities.

Keywords: Gender, Gender Gap, Economic Sustainability, Smart City, Region, Regional Strategy, Urban Development, Urban Planning

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1. INTRODUCTION

Urban population growth and globalisation pose new challenges for urban planning, from environmental degradation to the exacerbation of social inequalities. By 2050, more than 68% of the world's population is expected to reside in cities (United Nations, 2018), underscoring the need for innovative solutions to support their sustainable development. The concept of a smart city involves the use of information and communication technologies (ICT) to optimise public services, save energy, and improve the quality of life. The European Commission defines a smart city as a combination of sustainable and economic development, and quality of life achieved by integrating physical, human, and social capital with digital infrastructure (Kotnala & Ghosh, 2018). However, the technological approach is often detached from social realities: women and vulnerable groups continue to face urban violence and limited access to services and transportation, highlighting the link between gender equality and sustainable urbanisation (Puttkamer, 2023). The Sustainable Development Goals (SDGs) emphasise the need for synergy between SDG 5 (gender equality) and SDG 11 (sustainable cities) (Ababneh et al., 2025).

Despite recognising the importance of gender, many innovative initiatives focus on technology and economic efficiency while ignoring differences in residents' needs. The literature emphasises that cities are cultural and economic centres where development implies improving the quality of life, and sustainability implies intergenerational justice (Ababneh et al., 2025). Gender shapes access to resources and opportunities, but the same research shows that the participation of women and marginalized groups in smart city planning remains low (Ababneh et al., 2025). In the context of accelerating urbanization and climate change, the inclusion of a gender perspective is becoming an integral part of sustainable development (Ababneh et al., 2025).

This study aims to fill the gap in contemporary reviews, where the gender perspective is often treated as merely an add-on to the technological agenda. The focus is on the question: how can smart cities be designed to enhance gender equality rather than reproduce inequalities? Given the scarcity of empirical research on gender in smart cities, this paper presents a comprehensive analysis that combines statistics, case studies, and policy recommendations.

The article sets out the following objectives: (1) to analyze the literature on gender aspects of smart cities and identify research gaps; (2) to assess the scale and dynamics of the digital gender gap based on ITU data; (3) to study case studies of gender-oriented projects and derive performance metrics; (4) to formulate testable hypotheses and recommendations for inclusive urban policies.

This study aims to connect two seemingly disparate fields: technological development and gender studies. Despite the rapid growth of interest in smart initiatives, there is still no comprehensive assessment of how digital transformation affects the daily lives of women and other marginalised groups. Modern cities are complex socio-technical systems; their effectiveness is determined not only by the introduction of sensors and algorithms, but also by the quality of public institutions, cultural norms, and the level of trust. Women have historically faced systemic barriers to accessing resources, opportunities, and spaces, and the digital transition risks perpetuating these inequalities if gender is considered only after the fact (Chant, 2013; Yellen, 2021; Ababneh et al., 2025).

It is important to emphasize that technologies are not neutral. They are created and implemented in specific political, economic, and cultural contexts and can therefore reproduce existing hierarchies. Recent research has shown that algorithms trained on historical data often inherit hidden biases (Criado Perez, 2019), which can potentially limit women's access to resources or employment unfairly, as artificial intelligence (AI) is used (Smith & Rustagi, 2021; Soria Sotelo, 2025). In this light, smart city approaches should be seen as part of a broader social contract: the effectiveness of digital technologies will depend on how deeply they are rooted in the values of equality, transparency, and openness. As urbanization increases the impact on ecosystems, the smart city concept must also include climate sustainability: gender-sensitive infrastructure planning (e.g., lighting, sanitation, cooling points during heat waves) simultaneously addresses environmental adaptation and the protection of women and girls (Puttkamer, 2023).

Another important perspective is an intersectional and cross-sectoral approach. Gender experiences intersect with class, ethnicity, age, and physical ability, so digital strategies must consider the diversity of user scenarios. For migrant women, women with disabilities, and older women, barriers may be related not only to economic resources but also to language and cultural constraints. International organisations emphasise that access to the internet and digital services has become an integral part of human rights; denial of such access limits women's participation in the economy, education, and politics (Singh & Sauter, 2024). Consequently, the smart city ideology should not be limited to optimising traffic or energy. However, it should include the creation of safe spaces, care facilities, and support services that promote social interaction and solidarity. Only such a socially oriented vector will enable digital cities to work in the interests of all their residents truly.

Our analysis is based on the idea that existing power structures shape technologies and can either transform or reinforce inequality. This paper explores how technology can contribute to inclusive development by ensuring accessibility and safety for all. Research begins with the hypothesis that integrating gender principles into the early stages of smart city planning enhances program effectiveness, reduces crime, and improves perceptions of safety, which will be tested through a case study analysis.

2. LITERATURE REVIEW

Smart cities are often positioned as a universal solution for sustainable development, but critics point out that the technological focus can lead to a “technology-centric” approach. Research emphasises the need to consider social factors when implementing ICT. Women, residents of poor neighbourhoods, the elderly, and people with disabilities have different mobility patterns and service needs than the “average” user. Therefore, standard smart systems may be ineffective for them (Puttkamer, 2023). Gender-sensitive planning involves creating safe streets, well-lit bus stops, caregiving infrastructure (playgrounds, toilets), and tools for residents to participate in decision-making (Puttkamer, 2023).

International studies show that women often face harassment and violence in urban spaces, even in wealthy European cities, where 25-45% of female respondents reported incidents of harassment (Puttkamer, 2023). The level of safety and comfort is determined not only by infrastructure, but also by behavioural and cultural norms (Whitzman et al., 2013; Jalalkamali & Doratli, 2022), which is why gender mainstreaming is becoming a key principle of sustainable urbanism. The Frontiers review emphasizes that the link between SDG 5 and SDG 11 lies in the use of smart technologies to solve social problems, promote sustainability principles, and improve transportation for women (Ababneh et al., 2025).

The tendency to rely on cameras, sensors, and analytics to ensure safety is often accompanied by an underestimation of privacy rights. As UN Women notes, video surveillance systems without institutional support from social services can only create an illusion of safety, leaving the root causes of violence unaddressed (Kotnala & Ghosh, 2018). In addition, digital harassment is becoming an increasingly serious problem, especially in countries with poor legal protection. Ultimately, the underrepresentation of women in planning means that many decisions are made without considering women's experiences. Women are underrepresented among architects, transportation engineers, and ICT developers (Puttkamer, 2023; Sánchez de Madariaga & Roberts, 2013; U.S. Bureau of Labor Statistics, 2017), which reduces cities' ability to take into account the needs of mothers, older people, and people with disabilities. As a result, infrastructure is geared toward the “average” user, who is most often a middle-aged man.

Another most apparent manifestation of inequality is the digital gender gap, the difference between men and women in access to the internet, digital devices, and the ability to use them. In Asia and the Pacific, only 54% of women have access to the internet. Women are 36% less likely to use the internet than men (Singh & Sauter, 2024). Reasons include low digital literacy, high device costs, cultural constraints, and inadequate infrastructure (Singh & Sauter, 2024). The inaccessibility of digital services exacerbates economic inequality and limits opportunities for distance learning and medicine (Singh & Sauter, 2024).

An additional challenge is algorithmic bias. Studies have shown that 44% of AI systems implemented in various fields demonstrate gender bias (Berkeley Haas Center for Equity, Gender and Leadership, 2021; Soria Sotelo, 2025). Bias arises from training on incomplete data and the lack of gender-disaggregated statistics (Soria Sotelo, 2025), leading to unequal distribution of resources (e.g., recommendation algorithms focused on male routes).

Based on the above, it can be observed that existing research in the field of smart cities primarily focuses on a technology-centric discourse, prioritising the implementation of digital solutions, enhancing the efficiency of urban infrastructure, and stimulating economic growth. Social aspects, including gender equality issues, often remain unexplored. In addition, a review of the literature reveals that the gender perspective in urban planning is closely tied to the accessibility of transportation systems, the safety of public spaces, the availability of care and support infrastructure, and the level of women's participation in decision-making processes. The lack of attention to these issues leads to the reproduction of inequalities in access to resources and services, as well as the exclusion of the needs of significant population groups from planning decisions (World Bank, 2020).

In low-income countries, this lack of attention hinders women's access to the internet, digital services, educational resources, and remote forms of employment. This gap is exacerbated by algorithmic bias, where digital systems trained on incomplete or unrepresentative data reproduce gender stereotypes and unevenly distribute access to services. Therefore, it is necessary to include gender-disaggregated data in planning processes, develop technologies that take into account user diversity, and ensure a balance between security and the protection of individual rights. A review of the literature showed that only with this approach can digital and infrastructure solutions help reduce existing inequalities rather than exacerbate them, creating more equitable and sustainable cities.

3. METHODOLOGY

The sources used in this paper were the academic databases Scopus, Web of Science, and Google Scholar, as well as the official portals of international organizations (ITU, UN Women, UN Habitat, UNESCAP). The search covered the period 2015–2024 and was conducted in Russian and English. The following key queries were used: “smart city” AND “gender”, “women” AND “smart cities”, “digital divide” AND ‘gender’, “safety app” AND city name. Additional sources (dissertations, city council reports) were searched for through city administration websites.

In the first stage, a pool of 120 documents was formed. Duplicates and irrelevant types of publications (e.g., blog posts, commercial press releases) were removed; after this operation, 110 unique records remained. Next, the titles and abstracts were reviewed, and 70 works were selected based on the inclusion criteria (peer-reviewed, official statistics, and content related to gender and smart cities). At the final stage of full reading, 25 publications were left, which formed the basis of the analysis. Exclusion criteria: lack of gender data, technological descriptions without a social component, materials prior to 2015 (excluding historical references). The selection scheme is presented in Figure 1.

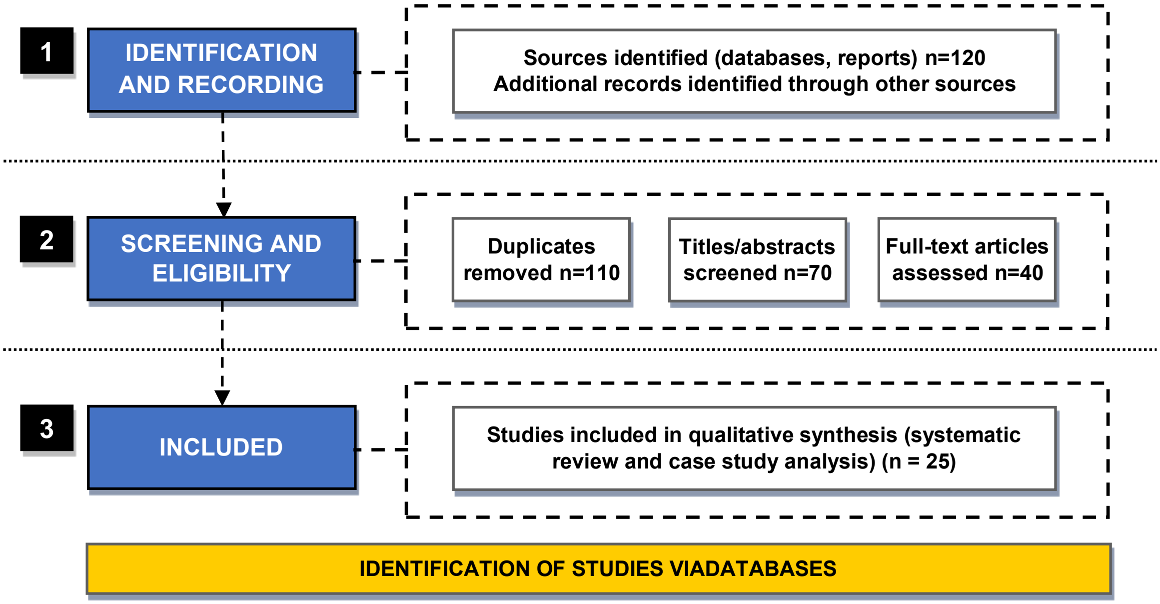


Figure 1. Literature selection scheme (modified PRISMA)

The statistical part is based on ITU data from the report Facts and Figures 2024 – the gender digital divide (ITU, 2024) and updated indicators of the gender parity index by region (ITU, 2024). For visualization purposes, graphs and tables were constructed showing the share of Internet users by gender, the dynamics of the GPS index, and the difference in the number of users.

The qualitative analysis included thematic coding of texts, identification of categories (digital divide, data bias, security, participation), and cross-referencing of these categories with case study data. Four cities were selected for the case studies—Barcelona, Amsterdam, Seoul, and Dhaka/Chennai—based on the following criteria: (1) the presence of a documented gender agenda in smart programs; (2) the availability of official reports and accessible metrics; (3) geographical diversity and level of digitalisation. Data on initiatives were collected from official municipal reports, scientific journal publications, and international organisation portals.

The analytical tools included: (1) thematic coding to identify problems and solutions; (2) comparative analysis of regional indicators, including comparative GPS indicators and improvement rates; (3) visualization of statistical data using diagrams and tables; (4) development of recommendations grouped by level (municipalities, transport and communications operators, developers, NGOs) with an indication of possible metrics for success.

The selection and screening scheme for publications is shown in Figure 1. It shows the process from the initial search to the final set of works used in the analysis.

Qualitative analysis was conducted using thematic coding. Based on the selected articles, five categories were identified: (1) digital divide; (2) algorithmic bias; (3) security and privacy; (4) participation and representation; (5) infrastructure and maintenance. Two researchers independently coded the texts (using NVivo software) and discussed ambiguous passages. To assess the consistency of the coders, Cohen's κ was calculated, which was 0.83, corresponding to a high level of reliability. Controversial passages were discussed until consensus was reached, and the coding framework was revised as necessary. This approach ensures the replicability and transparency of analytical conclusions.

4. RESULTS

ITU data show that in 2024, 70% of men and 65% of women worldwide had access to the internet, representing an improvement in gender parity compared to 2019 (0.91 → 0.94). The gap in the number of users has also narrowed: while in 2021 there were 277 million more men than women online, by 2024 this difference had decreased to 189 million (ITU, 2024).

The visualisation shows not only the percentage ratio, but also the absolute gap in the number of internet users. The improvement in indicators between 2021 and 2024 may be due to several factors: the spread of inexpensive smartphones, the expansion of mobile broadband access, and targeted digital literacy programs aimed at women and girls (GSMA, 2023, UN Women, 2025). Thus, Figure 2 shows the proportion of men and women with internet access, as well as the number of users in millions worldwide.

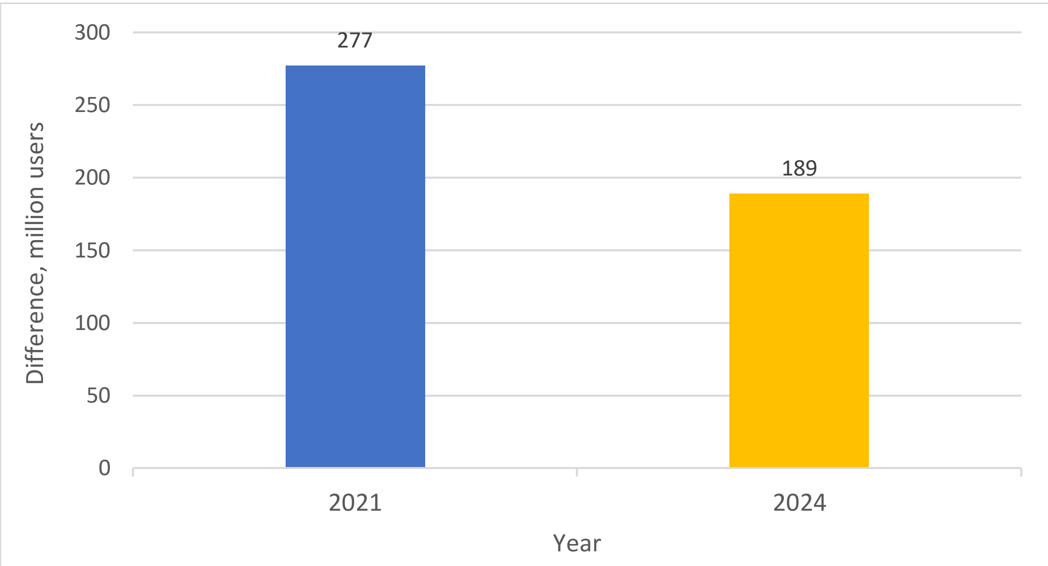


Figure 2. Proportion of men and women with internet access and difference in the number of users for 2021 and 2024

However, even with the gap narrowing in absolute terms, 189 million women still lack internet access compared to men, reflecting persistent inequality. Such differences are particularly prevalent in rural areas, where infrastructure is underdeveloped and cultural norms may limit women's access to technology. An analysis of the reasons for this gap reveals that high tariffs, low digital literacy, and weak connections between ICT policies and gender mainstreaming remain key barriers (Singh & Sauter, 2024).

Further analysis shows that the digital divide has distinct intergenerational and spatial characteristics. Young women in cities tend to be quicker to adopt digital services and utilise messaging apps, mobile banking, and learning platforms. In contrast, older women and those in rural areas are more likely to remain outside the digital economy. The reasons for this include low levels of general education, a lack of trust in technology, and security concerns. In several countries, girls are often denied their own smartphones or access to computers, as these devices are controlled by men, turning technology into a tool of control. These aspects underscore the need for programs targeting specific age groups and local communities, as well as campaigns that change cultural norms and persuade families of the benefits of digital education (Singh & Sauter, 2024).

It is equally important to understand that access to digital technologies does not guarantee their practical use. Women often face a "secondary" gap, where connectivity does not lead to full participation in the economy and politics. For example, online entrepreneurship and remote work require skills in financial management, marketing, and data analytics. Without digital literacy courses and support, such opportunities remain unrealised. In addition, digital platforms can expose women to cyberaggression and unwanted attention, which reduces their motivation to use the internet. In this context, governments and NGOs must not only provide access but also create safe online spaces, support mentoring programs, and develop services to protect against digital violence (Kotnala & Ghosh, 2018).

Finally, reducing the user gap should be seen as part of a broader picture that includes connection quality and service costs. In some regions, connections are unstable and expensive, limiting opportunities for streaming education or telemedicine. Gender-sensitive policies should consist of subsidising connectivity, developing public Wi-Fi zones, and encouraging competition among operators. Such measures, as successful examples from the Asia-Pacific region demonstrate, enable women to participate more actively in the digital economy and lay the groundwork for poverty reduction (Singh & Sauter, 2024).

The Gender Parity Score (GPS) shows the ratio of women to men among Internet users. Figure 3 illustrates the global change in this index between 2019 and 2024, where the index approaches 1 as the gap between the two values narrows.

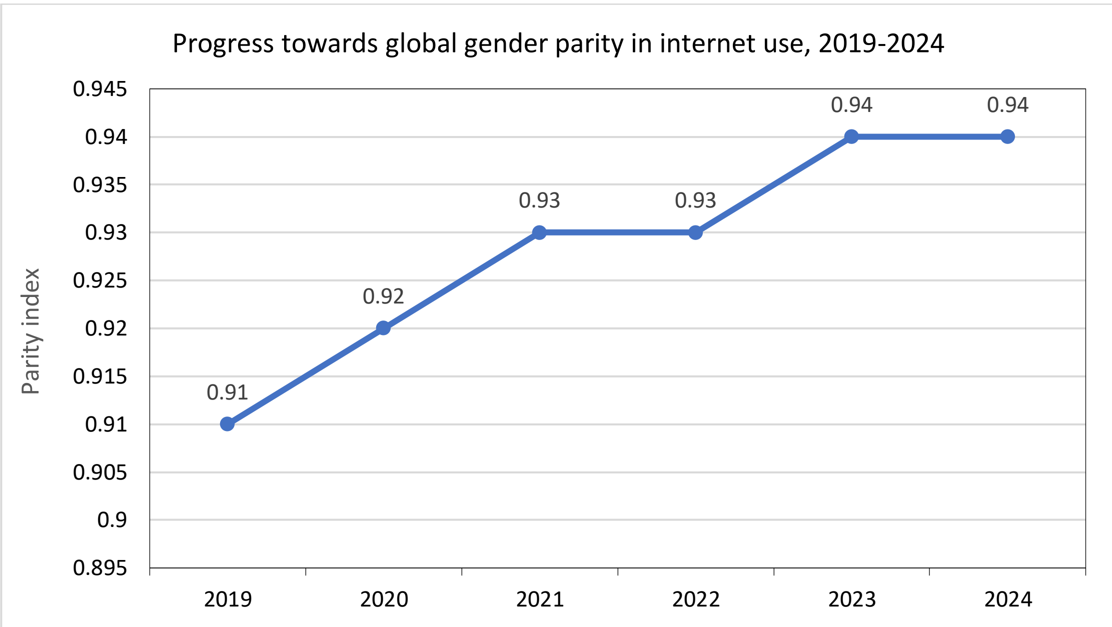


Figure 3. Dynamics of the global Gender Parity Index for 2019–2024

Note: compiled by the authors based on data ITU (2024)

The growth of the global GPS index from 0.91 to 0.94 reflects a gradual narrowing of the gap; however, the graph shows that the pace is slowing. After an increase in 2020–2021 (0.92 → 0.93), progress stalled, and by 2024, the value remained at 0.94. This suggests that the initial successes were probably achieved at the expense of “easily accessible” groups, while achieving parity (1.0) will require complex structural changes in education, employment, and legal regulation. An important conclusion is that even a slight improvement in the index has a significant impact on the lives of millions of women; a 0.01 increase in the GPS means that a significant number of women are connecting to the network. Therefore, national strategies should focus not only on expanding infrastructure but also on removing social and cultural barriers that affect Internet use (Singh & Sauter, 2024). Regions exhibit different dynamics.

Table 1 summarises the change in GPS by region between 2019 and 2024.

Table 1. Change in the Gender Parity Score (GPS) by region for 2019–2024

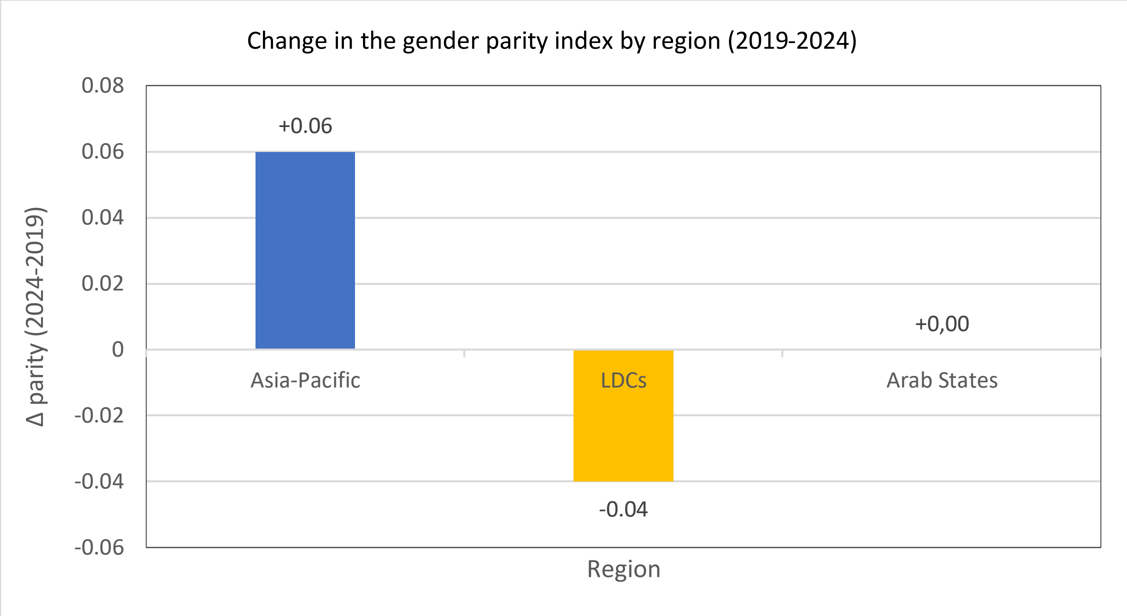
Region	Index 2019	Index 2024	Trend	Comment
Global level	0,91	0,94	improvement (+0.03)	the world is gradually moving towards gender parity (ITU, 2024)
Asia-Pacific	0,89	0,95	improvement (+0.06)	the region is showing significant progress (ITU, 2024)
Arab States	0,86	0,86	Stagnation (0)	The gap is not narrowing (ITU, 2024)
LDCs (Least Developed Countries)	0,74	0,70	Decline (-0.04)	The gap has widened, requiring intervention (ITU, 2024)
SIDS (Small Island Developing States)	>1,00	1,00	slight decrease	value fell but remained at parity (ITU, 2024)
Americas / Europe / CIS	–	≥0,98-1,02	parity achieved	parity achieved, baseline data for 2019 not provided (ITU, 2024)
Africa	–	–	improvement indicated	indicated region lags behind but is progressing (ITU, 2024)

Note: compiled by the authors based on data ITU (2024)

Table 1 and Figure 4 show that the Asia-Pacific region has made the most significant progress, with the GPS index rising from 0.89 to 0.95 (+0.06), while the global level increased from 0.91 to 0.94 (+0.03). At the same time, LDCs lost ground (a decline of -0.04), while Arab states showed stagnation, remaining at 0.86. These differences underscore the need for regional strategies to take into account local conditions and opportunities.

A more detailed analysis shows that successful regions, such as Asia-Pacific, combined government investment in infrastructure with market competition and civil society initiatives. There, government programs subsidised the cost of smartphones, promoted mobile applications in local languages, and developed campaigns to increase digital literacy among women. In Arab states, despite high GDP per capita, women's access to technology remains restricted by cultural barriers and low policy transparency (Singh & Sauter, 2024). A comparison of regions highlights that economic prosperity alone does not guarantee digital equality: a regulatory framework that supports women's rights and targeted programs to remove cultural barriers play a key role.

Figure 4 shows the change in the GPS index for several regions.



The distribution of the GPS index by region shows that SIDS (small island developing states) and the Americas/Europe/CIS have reached or even exceeded parity (values ≥ 1). Still, this success should be interpreted in light of the overall share of users: in SIDS, less than two-thirds of the population uses the internet (ITU, 2024), which means that small changes in absolute numbers can have a significant impact on the index.

Additional visualisation in Figure 5 shows GPS index values by region in 2024. A value above one means that the share of female users exceeds the share of male users (parity and above).

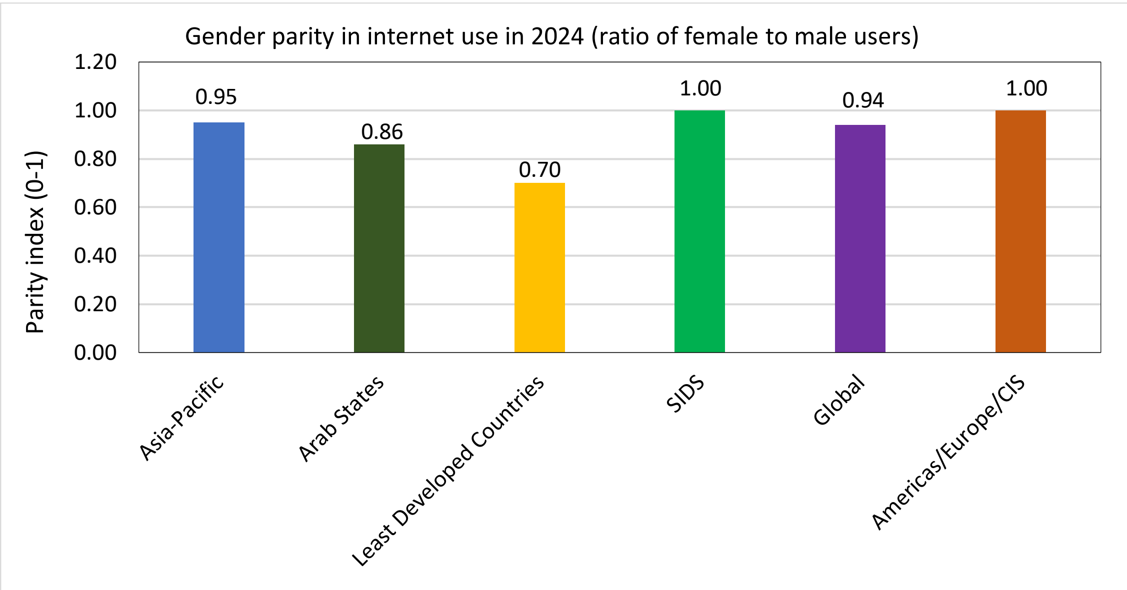


Figure 5. Gender Parity Index (GPS) by region in 2024

In the Americas/ Europe/ CIS regions, a high level of digital infrastructure is combined with high education indicators and gender equality policies, which contribute to achieving parity. The global level (0.94) and Asia-Pacific (0.95) show progress but have not yet achieved full equality. LDCs (0.70) lag significantly behind, underscoring the need for prioritised investment in women's digital literacy and access to communication services. Thus, the parity index should be analysed in conjunction with the overall share of users and context: high GPS values do not always mean high coverage, as can be seen in the example of SIDS.

Further analysis highlights that regional differences in GPS are closely linked to economic and cultural factors. Countries with high per capita income may show stagnation or even decline if traditional gender roles limit women's participation in the economy, as observed in some Arab states (ITU, 2024). In contrast, in the Asia-Pacific region, positive dynamics have been driven by government smartphone subsidy programs, the mandatory introduction of gender analysis in service design, and the active role of women's NGOs. This shows that economic prosperity alone does not guarantee digital equality; it is achieved through a combination of political will, civic engagement, and cultural change (Singh & Sauter, 2024). In LDCs, the decline in the GPS from 0.74 to 0.70 indicates that infrastructure deficiencies, low levels of education, and gender norms are widening the gap, and simply building basic networks will not solve the problem.

In this regard, it is essential to note that the GPS index does not accurately reflect the quality and depth of digital participation. Women may be among the users, but they may use the internet exclusively for basic communications. At the same time, men are more likely to acquire professional skills and access high-income areas such as programming and fintech. Differences in connection speed, network security, and the availability of content in local languages also affect the quality of participation. Therefore, expanding access must be accompanied by initiatives to improve digital literacy, develop content for women and girls, and combat online violence (Kotnala & Ghosh, 2018). The GPS Index is a “first step” but not a comprehensive measure of digital equality.

Finally, the link between the digital divide and socio-economic resilience is becoming clear in light of climate and health crises. The COVID-19 pandemic has demonstrated that access to high-quality internet is crucial for education, telemedicine, and remote work. Offline women were deprived of these opportunities, which exacerbated economic and educational gaps. In the future, as cities face extreme weather events and population displacement, digital inclusion could become a factor in survival: from disseminating information about disasters to managing resource distribution. Therefore, regional and global strategies must consider digital equality as an element of climate resilience and support it on par with physical infrastructure.

Practical examples show how integrating a gender approach improves women's quality of life. Table 2 lists initiatives in Barcelona, Amsterdam, Seoul, and Dhaka/Chennai.

As part of the Lighting Masterplan program, approximately 1,100 smart streetlights were installed, resulting in 30% energy savings and approximately €4.5 million in annual savings (Maçon-Dauxerre, 2020). The IoT infrastructure includes 19,500 smart meters and 670 Wi-Fi hotspots; the program has saved $58 million in water supply and created approximately 47,000 jobs (Adler, 2016).

A number of sources also note a reduction in street crime of approximately 20% thanks to smart lighting (Welsh et al., 2022). For Amsterdam, Seoul, and Dhaka/ Chennai, significantly less quantitative data is available: indicators for bicycle lane coverage, security app usage are not published in open sources, as highlighted in the limitations section. A comparison of cases shows that the effectiveness of gender-oriented smart initiatives depends not only on the technology itself, but also on the economic context.

Table 2. Gender-inclusive initiatives and metrics in smart cities

City	Initiative/ technology	Description	Quantitative indicators (KPIs)
Barcelona	Smart lighting, IoT, and Wi-Fi	The city has installed smart streetlights, sensors, mobile apps, and deployed an IoT infrastructure with 19,500 smart meters and 670 Wi-Fi hotspots (Fortune, 2015). These solutions enhance visibility, enable women to plan their routes in real-time, increase energy efficiency, and provide free access to the network (Ababneh et al., 2025).	1,100 smart streetlights, 30% energy savings, and €4.5 million in savings per year; 19,500 smart meters; 25% water savings and $58 million in water supply savings; 670 Wi-Fi hotspots; 47,000 new jobs; €50 million in additional parking revenue; a reduction in street crime of approximately 20% (Adler, 2016; Maçon-Dauxerre, 2020; Welsh et al., 2022).
Amsterdam	Gender-sensitive transport design	The authorities and women's NGOs are designing bicycle and pedestrian routes that take into account the needs of women, mothers, and people with disabilities; route data is used to adapt infrastructure (Ababneh et al., 2025).	Quantitative data on the impact of the initiative has not been published; metrics (e.g., number of lit bike paths or proportion of female users) are not available — this uncertainty is noted in the limitations section.
Seoul	Ansimi app and safety programs	Seoul developed the Ansimi mobile app for sending distress signals and tracking routes, created video surveillance zones and women's parking lots, and organized digital literacy courses for women (Singh & Sauter, 2024).	The Ansimi app has been downloaded more than 100,000 times; there are no official reports on crime reduction or parking lot usage.
Dhaka / Chennai	Digital security audit and crowdsourcing	The apps allow women to mark dangerous locations on a map; the data collected is used by municipalities to improve lighting, organize patrols, and manage roads (Soria Sotelo, 2025).	There is no available data on the quantitative effects (e.g., the number of dangerous areas marked or the reduction in incidents).

Note: compiled by the authors based on literature and official reports (Ababneh et al., 2025; Soria Sotelo, 2025; Adler, 2016; Maçon-Dauxerre, 2020)

Thanks to a long-term strategy (since the early 2010s) and investment in IoT infrastructure, Barcelona has achieved measurable effects, including energy savings, employment growth, and crime reduction. At the same time, the programs initially included an assessment of the impact on vulnerable groups. In Amsterdam and Seoul, initiatives are developing in parallel with participation policies: the authorities actively cooperate with women's organisations, conducting public consultations and providing data in an open format. However, quantitative indicators are still rarely published, which indicates insufficient evaluation of programs and the complexity of measuring social effects. Dhaka/Chennai, despite limited resources, demonstrate an innovative approach—the use of crowdsourcing applications to map dangerous areas. However, the success of these initiatives is limited by the availability of smartphones and the literacy level of the population. These differences underscore the necessity of tailoring technologies to local conditions and developing indicators to evaluate the impact of programs on women's safety and mobility.

Additionally, case studies demonstrate that combining physical infrastructure (such as lighting, well-maintained sidewalks, and video surveillance) with digital services (including mobile apps and feedback platforms) has a synergistic effect. For example, smart lighting in Barcelona not only reduces energy costs but also creates a sense of security, allowing women and girls to move freely at night. Similarly, women's parking lots and escort apps in Seoul increase comfort and can stimulate economic activity, as women use public transport more frequently and attend cultural events. Such solutions must be complemented by social programs, including digital skills training, information about rights and opportunities, and support for women's entrepreneurship.

The potential for scaling up the initiatives studied depends on financial and regulatory conditions. Barcelona was able to finance its plan through the municipal budget and private partnerships, whereas cities in the Global South often rely on international grants and pilot projects. Nevertheless, even low-budget programs such as collecting data on dangerous areas through free apps can yield quick results if accompanied by political will and community participation. For countries with limited resources, projects related to lighting and improving public transportation infrastructure may be a priority, as they directly impact the sense of safety and access to education and employment.

A more detailed examination of the cases reveals the specific features of each initiative and provides lessons for scaling up. Back in 2012, Barcelona began deploying an integrated fiber-optic network and thousands of sensors to track traffic, water consumption, and noise (Bakıcı et al., 2013). This infrastructure formed the basis of the Lighting Masterplan, which allows real-time brightness control and reduces energy consumption by 30%. An important aspect of the program was that the city collected feedback from residents through mobile apps and women's councils, which enabled the identification of dangerous areas and the rapid adjustment of lighting scenarios. Thus, the technological solution is linked to the ongoing participation of users and tied to a broader sustainability plan that includes water conservation, parking modernization, and job creation (Adler, 2016; Maçon-Dauxerre, 2020)

In Amsterdam, gender-sensitive transport design has manifested itself in specific practices: the city has adapted bike lanes for strollers and applied ergonomic design for people with disabilities; additional public transport stops were introduced near kindergartens and care centres, and tram schedules were adjusted to take into account the time when women return home from work. These changes resulted from an extended dialogue among the municipality, women's organisations, and the academic community. Although quantitative indicators have not yet been published, qualitative data indicate an increase in women's satisfaction with transport and a decrease in incidents of harassment at stations. Amsterdam is also investing in IT platforms for consultation, allowing residents to vote on priority changes, which increases transparency and accountability (Ababneh et al., 2025).

The example of Seoul shows how a digital safety ecosystem can be integrated into urban infrastructure. The Ansimi app connects users with the police, allowing them to track their route in real-time. At the same time, surveillance cameras and designated parking spaces for women ensure physical safety, while digital literacy courses help women utilise the services effectively. Seoul also runs campaigns to raise awareness of gender-based violence and has set up hotlines to support victims. Despite the lack of official data on the decline in crime, the app's popularity (over 100,000 downloads) suggests that residents trust this approach. The government continues to update the service, adding language and inclusive features (Singh & Sauter, 2024).

In the cities of Dhaka and Chennai, digital safety audits are based on crowdsourcing platforms where women report dangerous streets, inadequate lighting, or a lack of transportation. This data is sent to municipal authorities, who develop plans to improve infrastructure, including installing streetlights, creating safe routes to schools and markets, and establishing patrols. Experience shows that the effectiveness of such programs depends on the availability of smartphones, literacy levels, and the responsiveness of authorities. In some areas, the creation of women's self-help groups has been key to success: they help other women download the app, teach safety, and accompany them on their journeys. Thus, digital solutions work when they are accompanied by a strong community and support from NGOs (Soria Sotelo, 2025).

Taken together, these examples demonstrate that the success of gender-focused initiatives depends on the symbiosis of technology, institutional support, and public participation. Technology only amplifies the effects if local authorities are willing to invest in infrastructure and listen to residents. Women's NGOs and activist groups act as intermediaries between the community and municipalities, providing feedback and oversight. The key conclusion is that each city requires an individualised strategy that considers its unique cultural and economic characteristics; solutions cannot be copied without adaptation. At the same time, the general principles are clear: quality data, transparency and accountability, joint planning, and consideration of the needs of marginalised groups.

A review of the literature revealed several key obstacles. Table 3 summarizes the main barriers, their causes, and consequences.

Table 3. Main barriers and risks to gender-inclusive smart cities

Barrier/problem	Causes and manifestations	Consequences
Digital gender gap	Low digital literacy; high prices for devices and connectivity; cultural norms; limited infrastructure (Singh & Sauter, 2024).	Limited access for women to education, healthcare, e-commerce, and civic participation; women with disabilities and residents of poor areas are most vulnerable (Singh & Sauter, 2024).
Algorithmic bias	Training AI on historical data where women are underrepresented; lack of gender-disaggregated data (Soria Sotelo, 2025).	Algorithms repeat gender stereotypes and reinforce the uneven distribution of resources.
Risk of surveillance and privacy violations	Reliance on video surveillance without legal protection; increase in digital violence and dissemination of personal data (Kotnala & Ghosh, 2018).	Violation of women's privacy; decreased trust in digital services and authorities.
Lack of participation and representation	Low representation of women among urban planners and ICT developers; limited access to digital platforms (Puttkamer, 2023).	Services are geared toward the "average" (male) user; infrastructure does not take into account the needs of mothers and people with disabilities.

Note: compiled by the authors based on literature (Singh & Sauter, 2024; Soria Sotelo, 2025; Puttkamer, 2023).

The barriers presented in Table 3 are closely interrelated. The digital gender gap is the foundation on which the other problems are built: lack of access to the internet prevents women from participating in online education, leaving them out of the high-tech employment market. Algorithmic bias exacerbates the gap, as recommendation systems based on historical data often invisibly exclude women from decision-making processes. Solving these problems requires a comprehensive strategy: governments should subsidise the cost of connectivity, and companies should publish data on algorithmic risks and involve ethics and gender experts in AI development. The danger of surveillance underscores that security cannot be built solely on total surveillance; a legal framework regulating data processing and storage is crucial, as is the existence of independent control and feedback mechanisms. Lack of participation is a cross-cutting issue: without women in design teams and politics, the results will be geared towards male needs and therefore incomplete. Removing these barriers requires both structural changes (e.g., representation quotas) and cultural transformation aimed at revising gender stereotypes in society.

5. CONCLUSION

Smart cities have the potential to be a powerful tool for gender equality. However, this potential can only be realised through a comprehensive approach that combines technology with social innovation and policy reform. According to ITU data, the global digital divide is narrowing, but remains significant, especially in LDCs and Arab states, requiring flexible, context-sensitive strategies. Case studies from Barcelona, Amsterdam, Seoul, and Dhaka/Chennai demonstrate that integrating physical infrastructure (such as lighting and transportation) with digital services (including mobile apps and gender-disaggregated data) enhances women's safety and engagement. However, without gender mainstreaming, data ethics, and real civic participation, smart systems risk reinforcing existing inequalities. This study contributes to the interdisciplinary field of “smart cities, gender, and sustainability” (Bibri & Krogstie, 2017) by proposing a methodology that combines quantitative analysis, thematic coding, and case studies, allowing for the simultaneous identification of structural barriers and the scaling up of successful practices. The results underscore the need to shift from a technology-centric to a human-centric approach: digital infrastructure must be complemented by measures to expand women's rights, increase their economic independence, and enhance their participation in decision-making processes. A promising direction is the development of a regulatory framework for assessing gender inclusiveness with indicators of access (the proportion of women using the internet and digital services), safety (the level of crime and harassment in “smart” neighborhoods), participation (the representation of women in the management of transport and technology companies), and impact (income and employment growth). International coalitions such as UN Women and ITU can play a key role in standardisation and data exchange.

Future research should focus on refining indicators, assessing the long-term effects of emerging technologies on women's daily lives, and developing legal mechanisms to protect digital rights. Finally, an intersectional approach is critical: women's experiences intersect with class, ethnicity, age, and disability, so without taking into account the needs of migrant women, women with disabilities, and older women, “smart” projects risk becoming solutions for the privileged. Based on the principles of participation, transparency, and social justice, smart city innovations can become part of the global movement for gender equality and truly serve everyone.

AUTHOR CONTRIBUTION

Writing – original draft: Marat Urdabayev.
Conceptualization: Marat Urdabayev.
Formal analysis and investigation: Marat Urdabayev.
Development of research methodology: Marat Urdabayev.
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REFERENCES

Ababneh, A., Lok, K. L., Abdeyazdan, H., Opoku, A., & Chen, C. (2025). Gender equality in smart sustainable cities: Literature review. *Frontiers in Sustainable Cities, 7,* Article 1535561. https://doi.org/10.3389/frsc.2025.1535561

Adler, L. (2016, February 18). How smart city Barcelona brought the Internet of Things to life. *Data-Smart City Solutions*. Harvard Kennedy School. https://datasmart.hks.harvard.edu/news/article/how-smart-city-barcelona-brought-the-internet-of-things-to-life-789

Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities, 47,* 95–106. https://doi.org/10.1016/j.cities.2015.05.004

Bakıcı, T., Almirall, E., & Wareham, J. (2013). A smart city initiative: The case of Barcelona. *Journal of the Knowledge Economy, 4*(2), 135–148. https://doi.org/10.1007/s13132-012-0084-9

Berkeley Haas Center for Equity, Gender and Leadership. (2021). *Analysis of 133 biased AI systems*. Stanford Social Innovation Review. https://ssir.org/articles/entry/when_good_algorithms_go_sexist_why_and_how_to_advance_ai_gender_equity

Bibri, S. E., & Krogstie, J. (2017). Smart sustainable cities of the future: An extensive interdisciplinary literature review. *Sustainable Cities and Society, 31,* 183-212. https://doi.org/10.1016/j.scs.2017.02.016

Chant, S. (2013). Cities through a "gender lens": A golden "urban age" for women in the global South? *Environment and Urbanization, 25*(1), 9–29. https://doi.org/10.1177/0956247813477809

Criado Perez, C. (2019). *Invisible women: Data bias in a world designed for men.* Abrams Press.

Fortune. (2015, July 29). Barcelona: The most wired city in the world. *Fortune.*https://fortune.com/2015/07/29/barcelona-wired-city/

GSMA. (2023). *The mobile gender gap report 2023.* GSM Association. https://www.gsma.com/r/gender-gap/

International Telecommunication Union. (2024, November 10). *Facts and figures 2024: The gender digital divide.* In *Measuring digital development: Facts and figures 2024.* ITU. https://www.itu.int/itu-d/reports/statistics/2024/11/10/ff24-the-gender-digital-divide/

Jalalkamali, A., & Doratli, N. (2022). Public space behaviors and intentions: The role of gender through the window of culture, case of Kerman. *Behavioral Sciences, 12*(10), 388. https://doi.org/10.3390/bs12100388

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal, 79*(1), 1–14. https://doi.org/10.1007/s10708-013-9516-8

Kotnala, S., & Ghosh, R. (2018). Calling for a gender approach to "smart" and "resilient" cities. *Women's Resilience to Disasters Knowledge Hub.* UN Women. https://wrd.unwomen.org/explore/insights/calling-gender-approach-smart-and-resilient-cities

Maçon-Dauxerre, E. (2020, May 12). 5 benefits of cellular IoT-driven smart lighting systems for cities. *Telit Cinterion Blog.* https://www.telit.com/blog/5-benefits-iot-driven-smart-lighting-solutions-cities/

Puttkamer, L. (2023, July 10). Women in the gender-inclusive smart city. *Bee Smart City.*https://www.beesmart.city/en/smart-city-blog/women-in-the-gender-inclusive-smart-city

Sánchez de Madariaga, I., & Roberts, M. (Eds.). (2013). *Fair shared cities: The impact of gender planning in Europe.* Ashgate.

Singh, S. D., & Sauter, F. (2024, September 12). Building inclusive smart cities: Bridging the gender gap. *Asia-Pacific Portal for Gender Equality.* https://www.asiapacificgender.org/blogs/building-inclusive-smart-cities-bridging-gender-gap

Smith, G., & Rustagi, I. (2021). When good algorithms go sexist: Why and how to advance AI gender equity. *Stanford Social Innovation Review.*https://ssir.org/articles/entry/when_good_algorithms_go_sexist_why_and_how_to_advance_ai_gender_equity

Soria Sotelo, L. (2025, March 13). AI in urban life: The hidden gender bias shaping our cities. *Urbanet.*https://www.urbanet.info/ai-urban-safety-gender-bias-shaping-our-cities

U.S. Bureau of Labor Statistics. (2017). *Women in architecture and engineering occupations in 2016.* U.S. Department of Labor. https://www.bls.gov/opub/ted/2017/women-in-architecture-and-engineering-occupations-in-2016.htm

UN Women. (2025, February). How AI reinforces gender bias—and what we can do about it. *UN Women.*https://www.unwomen.org/en/news-stories/interview/2025/02/how-ai-reinforces-gender-bias-and-what-we-can-do-about-it

United Nations, Department of Economic and Social Affairs. (2018). *68% of the world population projected to live in urban areas by 2050, says UN.* UN DESA. https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

Welsh, B. C., Farrington, D. P., & Douglas, S. (2022). The impact and policy relevance of street lighting for crime prevention: A systematic review based on a half-century of evaluation research. *Criminology & Public Policy, 21*(3), 739–765. https://doi.org/10.1111/1745-9133.12585

Whitzman, C., Legacy, C., Andrew, C., Klodawsky, F., Shaw, M., & Viswanath, K. (Eds.). (2013). *Building inclusive cities: Women's safety and the right to the city.* Routledge.

World Bank. (2020). *Handbook for gender-inclusive urban planning and design.* World Bank. https://www.worldbank.org/en/topic/urbandevelopment/publication/handbook-for-gender-inclusive-urban-planning-and-design

Yellen, J. (2021). The history of women's work and wages and how it has created success for us all. *Brookings Institution.* https://www.brookings.edu/articles/the-history-of-womens-work-and-wages-and-how-it-has-created-success-for-us-all/

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Motherhood, Part-Time Work, and Gender Pay Gap in Kazakhstan

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Abstract

Gender inequality in the labour market remains a persistent issue in Kazakhstan despite legislative progress and improved educational attainment among women. This study aims to assess the impact of motherhood, part-time employment, and access to preschool education on women's economic participation and the gender pay gap. The research applies a quantitative methodology based on official data from the Bureau of National Statistics of Kazakhstan for the period 2001–2023. Descriptive statistics, growth rate analysis, and Pearson's correlation analysis were used to examine key structural, institutional, and demographic indicators. The analysis reveals a strong negative correlation between the share of children under age three enrolled in preschool and the gender pay gap ($r = –0.878$), as well as a strong positive correlation between part-time employment and the gender pay gap ($r = 0.811$). Over two decades, preschool coverage increased from 4.3% to 47.8%, while the share of women working part-time dropped from 41% to 6%. Additionally, a negative correlation was found between the number of women applying to employment services and the gender pay gap ($r = –0.769$), indicating the importance of active labour market policies. The findings confirm that expanding preschool infrastructure, promoting formal employment, and supporting women's return to work can reduce gender disparities. Policy recommendations are proposed to strengthen gender equity and female economic empowerment in alignment with SDG 5.

Keywords: Gender, Gender Inequality, Gender Pay Gap, Maternity Penalty, Part-Time Employment, Preschool Education

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1. INTRODUCTION

Gender equity is a significant component of sustainable development and economic growth. Despite improvements in legislation and the achievement of gender equality in education and political representation through gender quotas, economic inequality between men and women persists. Women remain underrepresented in managerial positions and face both cultural and structural barriers that limit their participation in the labour market. Achieving work–family balance is also essential; however, according to the Bureau of National Statistics (2025), women spend an average of 3.5 hours per day on unpaid domestic labour, while men spend only 1.1 hours.

Gender equity is a significant component of sustainable development and economic growth. Despite improvements in legislation and the achievement of gender equality in education and politics, the gender pay gap remains substantial, especially in Kazakhstan. It is driven by occupational and sectoral segregation, unequal distribution of care responsibilities, and limited access to leadership positions (Tomaskovic-Devey & Skaggs, 2002). Women are more likely to work part-time or in informal jobs due to family obligations, which deepens inequality (Ghilarducci & Lee, 2005).

Motherhood significantly affects women's career prospects through what is known as the "motherhood penalty," characterised by lower wages, employment interruptions, and limited advancement opportunities (Manning & Robinson, 2004). Studies show that access to childcare and preschool education can mitigate these effects by supporting mothers' return to full-time, formal employment (Berlinski & Galiani, 2007). However, responses to childcare availability vary depending on education, region, and traditional gender norms (Abe, 2013; Akgunduz & Plantenga, 2018).

In Kazakhstan, gender inequality remains persistent despite progress in legal frameworks. Women are concentrated in low-paid sectors (Buribayev & Khamzina, 2019), face barriers to managerial roles (Kenzheali et al., 2024), and often leave the labor market due to insufficient access to childcare for children under three (Nugmanova et al., 2025). These patterns illustrate the continuing need effective institutional policies that promote gender equity and economic inclusion.

Nevertheless, a research gap remains regarding the impact of institutional measures on women's employment, including the effects of preschool infrastructure on the motherhood penalty, the level of formal employment, and the development of women-led enterprises in Kazakhstan.

Therefore, this research aims to analyse the relationship between key social and economic indicators affecting women's employment and to develop policy recommendations for reducing women's economic vulnerability in Kazakhstan. This research uses a quantitative research design based on data from the National Bureau of Statistics. Descriptive statistics and growth rates were calculated for key indicators of women's employment across five time points (2003–2023). In addition, Pearson's correlation analysis was conducted to assess the relationships between gender-related labour market variables.

To address this aim, the research is guided by the following research questions:

RQ1 – Does the maternity penalty impact female employment in Kazakhstan?

RQ2 – How does part-time employment among women relate to gender income inequality?

RQ3 – Do employment services reduce the gender pay gap?

The research is particularly relevant in the context of Kazakhstan's strategic commitments to the Sustainable Development Goals (SDG 5) and ongoing national efforts to strengthen female economic empowerment.

The paper is structured as follows: Section 2 presents the literature review. Section 3 outlines the methodology and data sources. Section 4 presents the descriptive and correlational findings. Section 5 discusses the policy implications and concludes with recommendations.

2. LITERATURE REVIEW

The gender pay gap remains significant in Central Asian countries. It is caused by sectoral and occupational segregation, which reflects both horizontal and vertical inequalities, as well as by the unequal distribution of care responsibilities and limited access to management positions, recruitment, and career promotion (Dickens & Lang, 1993; Tomaskovic-Devey & Skaggs, 2002).

In addition, a persistent gender gap is also driven by part-time jobs, informal employment, and horizontal segregation. Part-time employment affects men and women differently. According to Hirsch (2005), the income loss for women in part-time roles is smaller than for men. Women more often work part-time than men and are employed in lower-paid sectors (Ghilarducci & Lee, 2005). Furthermore, another factor contributing to the gender gap is the number of hours worked: women work 3-4 hours less per week than men (Baker & Drolet, 2010).

Family-related responsibilities also influence these patterns. Polachek (2014) found that the gender pay gap increases significantly after marriage, especially after childbirth. According to Antonie et al. (2020), women often opt for part-time employment due to family responsibilities. As a result, a persistent gender pay gap is also linked to marital status. Moreover, women usually consciously expect lower earnings when switching to part-time employment (Schrenker, 2023).

The link between motherhood and career outcomes has been thoroughly established in the literature. According to Manning and Robinson (2004), the pay gap between men and women increases after exiting paid employment and further widens with the accumulation of career breaks. Women with children face a maternity penalty that reduces their employment prospects, lowers income, and limits career growth opportunities (Rzhanitsyna, 2000). Additionally, Blau and Currie (2006) argued that labor market sorting expands pay inequality, especially in transitional economies.

In this context, access to early childhood education becomes crucial. Berlinski and Galiani (2007) found that the expansion of preschool organisations increases mothers' participation in the labour market. Furthermore, kindergartens reduce the motherhood penalty and promote full-time, formal employment for women (Loughran & Zissimopoulos, 2009). In line with this, Mourao (2013) emphasises that access to preschool education plays a crucial role in facilitating women's return to the labour market and reducing the negative impact of career breaks.

However, responses to improved childcare access are not uniform. Women's responses to improved access to childcare depend on regional female employment levels and cultural aspects, including traditional family roles (Abe, 2013; Akgunduz & Plantenga, 2018). A decline in the motherhood penalty is reflected not only in increased employment but also in improved job quality. According to Berthelon et al. (2024), there is a clear income gap between women with children and those without, which persists for years after childbirth. Their research shows that low-educated women are more likely to start full-time jobs and sign short-term contracts, while women with higher education gain access to more stable employment and higher income.

At the same time, maternity-related policies may have unintended consequences. The maternity penalty is higher in countries with high female labour force participation and strong institutional support for maternity leave (Kleven et al., 2019). Women invest less in skills and choose lower-paid jobs in anticipation of future career breaks (Meara et al., 2020). However, as Kolesnik et al. (2021) noted, risks remain. Extended parental leave reduces women's employment levels and limits their career advancement. Employment breaks lead to a partial loss of human capital and reduced labour efficiency. Moreover, employers tend to prefer hiring and promoting women who are unlikely to take long-term leave.

Finally, family structure also shapes women's career trajectories. There are mixed findings regarding the impact of marital status on careers. In families where the husband's career is prioritised, women’s promotions increase the likelihood of divorce. In contrast, this effect is absent in egalitarian families (Folke & Rickne, 2020). At the same time, the presence of marriage and children negatively affects women’s participation in entrepreneurship, with many women leaving business after marriage or childbirth (Ojong et al., 2021).

The situation with gender equality in Kazakhstan is improving; however, gender segregation still persists in low-paid sectors (Buribayev & Khamzina, 2019). The gender pay gap and the limited presence of women in management positions influence females in the labour market (Kenzheali et al., 2024). Preschool education for children under the age of three is limited in Kazakhstan (Nugmanova et al., 2025). As a result, many women leave the labour market or work part-time or in informal jobs, which increases social and economic inequality.

3. RESEARCH METHODS

This research employs a quantitative research design to examine the structural, institutional, and demographic factors that influence gender inequality in employment in Kazakhstan. The approach is based on secondary data analysis using official statistical indicators from the National Bureau of Statistics for the period 2001–2023. The research focuses on a set of indicators that capture key aspects of women's economic participation as presented in Table 1.

Table 1. Descriptive statistics

Code	Variable	Mean	Standard Error	Standard Deviation	Min	Max	Confidence Level (95.0%)
GPG	Gender pay gap	33,09	1,044	5,008	21,7	41,3	2,16
PRE3	Share of children under 3 in preschool	20,12	3,55	17,04	4,10	56,3	7,37
WLF	Share of women in labor force	78,487	0,204	0,978	76,4	80,3	0,42
WPT	Women working part-time	17,643	2,398	11,499	5,8	40,7	4,97
MAR	Number of marriages	135951,78	4067,51	19507,12	92852	168447	8435,51
DIV	Number of divorces	43405,08	1915,32	9185,56	29599	59796	3972,13
WES	Women applying to employment services	235408,95	22597,01	108371,47	125309	544459	46863,33
ISR	Income-to-subsistence ratio	180,07	4,949	23,73	124,65	207	10,26

Note: compiled by the author

The dataset comprises of observations spanning the period 2001-2023, covering women's participation in the labour market, demographics, and the social and economic sustainability of Kazakhstan. The chosen variables cover key structural, institutional, and demographic aspects that influence women's employment and income. These variables allow the gender pay gap to be analysed concerning access to preschool infrastructure, types of employment, marital status, and applications to employment services. The research structure is illustrated in Figure 1.

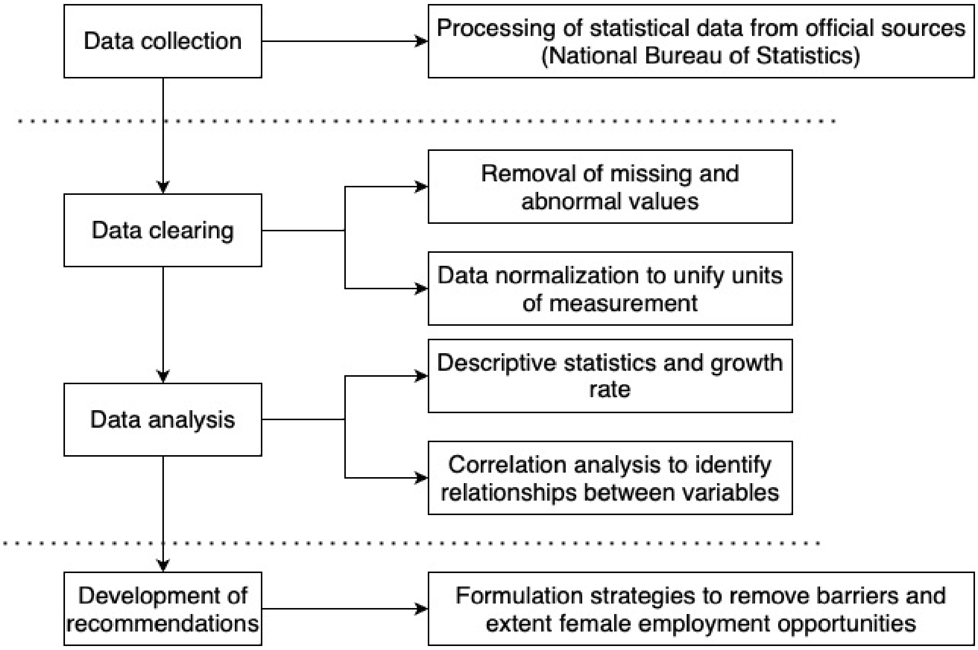

Figure 1. The stages of research implementation

The research consists of 4 stages. The first stage is data collection from Bureau of National Statistics for the period 2001-2023. The second stage is data cleaning, where missing data was removed for analysis. The third stage is data analysis, where descriptive statistics are provided, and correlation analysis is computed to identify relationships between variables. The fourth stage involves developing recommendations based on analysis and identifying barriers.

Statistical method

The analysis consists of three main stages. First, descriptive statistics were calculated to explore the distribution, central tendencies (mean), and dispersion (standard deviation, minimum, maximum) of the selected variables. This step helped to identify trends in the gender pay gap, part-time employment, preschool access, and women's participation in the labour market over time.

Second, growth rates of key indicators were calculated using a time-series approach, with 2003 selected as the base year. These growth rates enabled the assessment of long-term structural changes in women's employment and related socio-economic indicators across five observation points: 2003, 2008, 2013, 2018, and 2023.

Third, Pearson's correlation analysis was employed to assess the strength and direction of linear relationships between selected quantitative variables. This method is appropriate for identifying statistically significant associations between continuous variables such as the gender pay gap, preschool coverage, women's labour force participation, marital statistics, and applications for employment services. Pearson's correlation coefficient (r) is calculated using the following formula (1):

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right)\left(\sum y^2 - \frac{(y)^2}{n}\right)}} \qquad (1)$$

where:

n – number of paired observations;

$\sum xy$ – sum of the product of paired scores;

$\sum x$, $\sum y$ – sum of x-values and y-values;

$\sum x^2$, $\sum y^2$ – sum of squared x-values and y-values.

The correlation coefficients were interpreted according to the following criteria: $|r| \geq 0.90$ – very strong correlation, $0.70 \leq |r| < 0.90$ – strong correlation, $0.50 \leq |r| < 0.70$ — moderate correlation, and $|r| < 0.50$ – weak correlation.

The choice of the quantitative method is explained by the possibility of conducting a systematic and empirical analysis of the relationship between gender inequality in the labour market and social, economic, and institutional factors in Kazakhstan. The availability of data for the years 2003, 2008, 2013, 2018, and 2023 allows for the consideration of long-term changes in women's employment by economic activity, the share of children under the age of three in preschool, the number of women applying to employment services, and the level of women's unemployment.

Pearson's correlation analysis enables the interpretation of linear relationships between variables and the understanding of their strength. To develop effective policies, evidence-based and quantitative data are essential.

4. RESULTS

Kazakhstan has made significant progress in achieving gender equality. In particular, equality in the education system, the introduction of gender quotas for political representation in 2020 (Constitutional Law of the Republic of Kazakhstan, 2024), laws against violence toward women, and the expansion of women's presence in business. However, despite all legislative efforts, the position of women in the labour market remains uneven. Figure 2 illustrates the gender pay gap in Kazakhstan from 2000 to 2023.

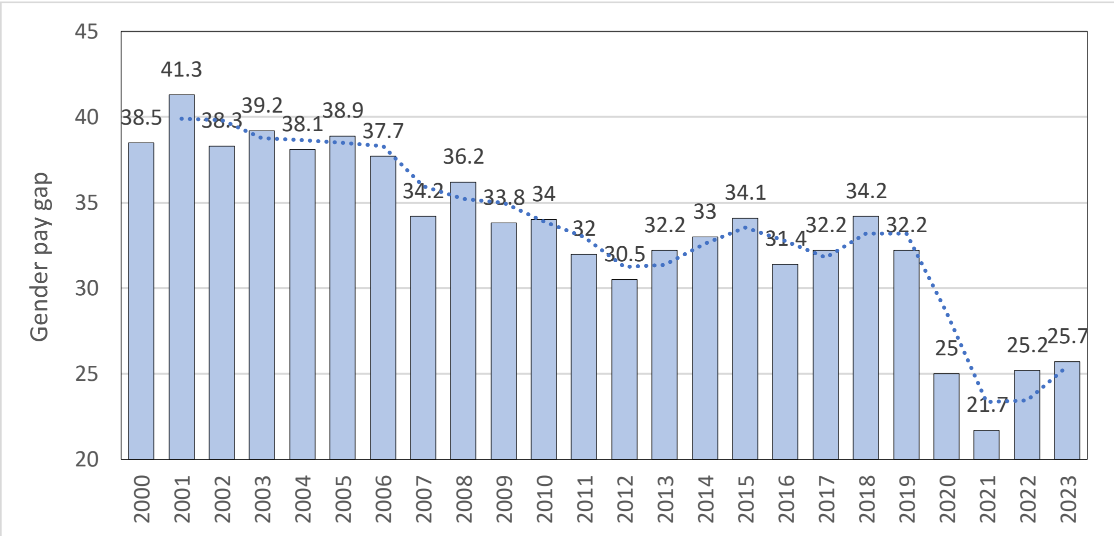

Figure 2. The gender pay gap in Kazakhstan from 2000 to 2023

Analysis reveals the changes in the gender pay gap in Kazakhstan from 2000 to 2023. In the early 2000s, the pay gap was approximately 39–40%, then began to steadily decline, reaching 34% in 2010 and 25% a decade later. A significant decrease occurred after 2019, likely in response to social, economic, and political changes. Despite the long-term positive trend in reducing the gender pay gap, the data also highlight the instability of these outcomes, which requires continued attention from state policy and the employment system. For a more detailed understanding of the underlying causes of the gender pay gap, the dynamics of women's participation in the labour market are presented in Table 2.

Table 2. Main indicators of women's labour market participation for 2003–2023

Year	Share of women employed by economic activity	Share of children under 3 in preschool	Women applied to employment services	Level of women unemployment	Change in women employment share (%)	Change in preschool coverage (%)	Change in women employment services (%)	Change in women unemployment %
2003	46,5	4,3	135586	10,4	0	0	0	
2008	47,3	5,6	129663	7,9	1,720	30,233	-4,368	-24,038
2013	46,9	15,6	180818	5,9	0,860	262,791	33,360	-25,316
2018	43,1	31,7	307567	5,4	-7,312	637,209	126,843	-8,475
2023	40,9	47,79	544459	5,3	-12,043	1011,395	301,560	-1,851

Note: compiled by the author based on Bureau of National Statistics (2024)

Analysis reveals the dynamics of key indicators, including the number of children in preschool, unemployment rates, and applications for employment services, concerning women's participation in the labour market between 2003 and 2023. Coverage of children under the age of 3 in preschool increased from 4.3% in 2003 to 47.8% in 2023, an almost elevenfold rise. This significant growth reflects the scale of institutional transformation in the early childhood sector and can be attributed to state policies promoting work–family balance. On the other hand, it may also indicate cultural shifts, such as a decline in the traditional role of grandparents in caregiving.

At the same time, the participation of women shrank from 46.5% to 40.9%, and 12% decrease, which could indicate structural changes in the economy, shifts in women's employment, or an increase in informal employment among women. The number of women applying for employment services increased by approximately 300%, indicating an expansion of institutional coverage, improved access to employment services, as well as growing social vulnerability and instability in the labour market.

By the decline in women's unemployment, there has also been a decrease in the share of women involved in part-time jobs and informal employment (see Figure 3).

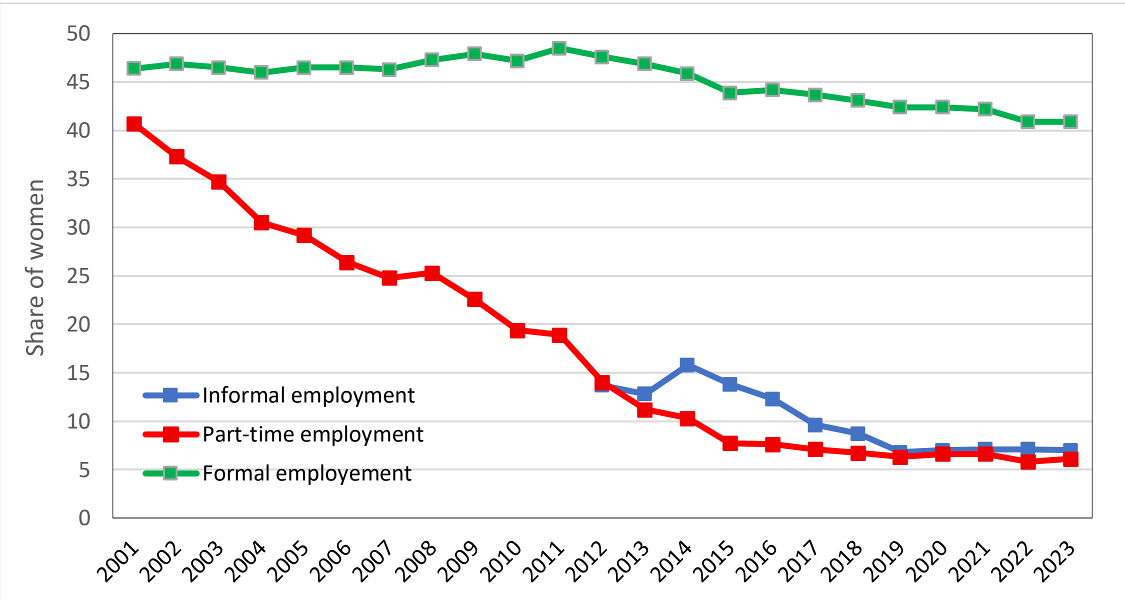

Figure 3. Trends of women employment in Kazakhstan for 2000–2022

The level of women's unemployment in Kazakhstan has shown a steady downward trend over the past two decades. In 2003, the unemployment rate among women stood at 10.4%, reflecting both the structural challenges of the post-Soviet labour market and the limited integration of women into formal employment sectors. By 2008, this figure had dropped to 7.9%, and continued to decline, reaching 5.9% in 2013, 5.4% in 2018, and 5.3% in 2023.

Analysis of female formal employment has shown a gradual downward trend. Specifically, the share of women in formal jobs decreased from approximately 46% in 2001 to around 41% in 2023. Analysis reveals that about 41% of women worked part-time in 2000; however, this figure shrank significantly over the following two decades. By 2023, the indicator had decreased to 6%, reflecting changes in the labour market structure or a transition of women to other types of employment. Additionally, the development of kindergarten infrastructure has helped women balance work and family life, enabling them to work full-time.

The share of women involved in informal employment fluctuated between 2012 and 2016. The reduction in informal employment may reflect improved labour market regulation and a decline in the shadow economy. This trend could also be linked to the legalisation of employment and the formal registration of businesses as sole proprietorships or limited liability partnerships (LLPs). Therefore, the percentage of enterprises led by women is presented in Figure 3.

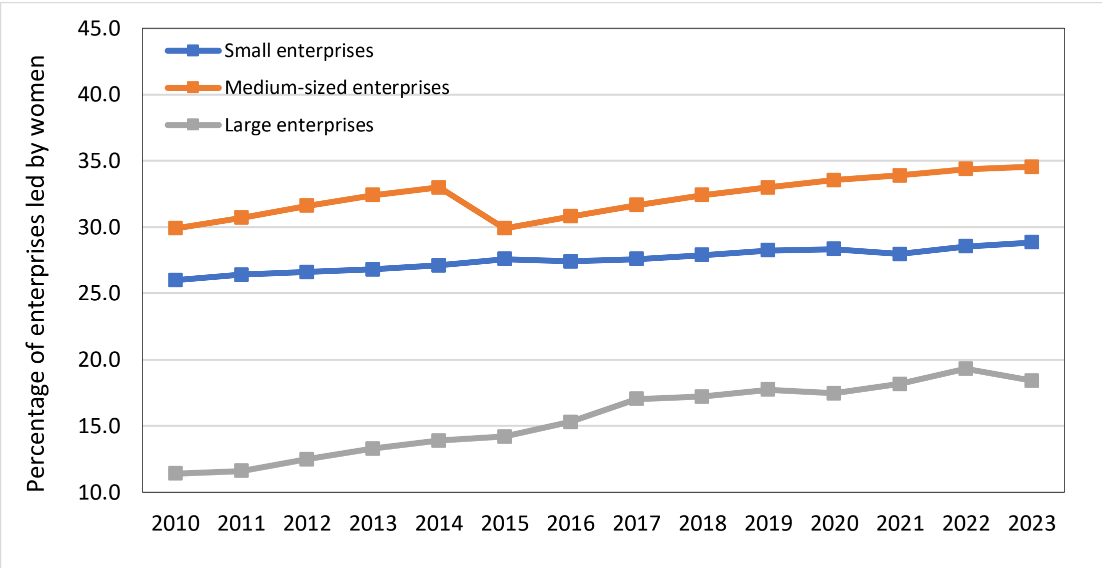

Figure 3. Percentage of enterprises led by women in Kazakhstan by enterprise type for 2010-2023

Analysis reveals the share of enterprises led by women in the period 2010–2023 by type. Small enterprises demonstrate gradual growth, increasing from 26% to 28.5%, which indicates a sustainable rise. Medium enterprises increased by 5% during the period, despite a temporary decline in 2015. While large enterprises have the smallest share of women bosses, they still showed 7% growth, with an insignificant decrease in 2023.

In general, the results show positive dynamics in the expansion of women's participation in business leadership. This trend is particularly evident in the steady growth of women-led small and medium-sized enterprises, as well as in the gradual increase in female representation within large enterprises.

These developments may reflect the cumulative impact of state policies aimed at supporting female entrepreneurship, improved access to financial and educational resources, and shifting societal attitudes toward gender roles in the business sector.

To identify the relationships between key social and economic indicators reflecting gender equality in the labour sphere, a correlation analysis was conducted in Table 3.

Table 3. Correlation matrix

Variable	GPG	PRE3	WLF	WPT	MAR	DIV	WES	ISR
GPG	1	-0,878	-0,359	0,811	-0,377	-0,553	-0,769	-0,588
PRE3	-0,878	1	0,502	-0,815	0,128	0,621	0,871	0,514
WLF	-0,359	0,502	1	-0,470	0,139	0,550	0,462	0,330
WPT	0,811	-0,815	-0,470	1	-0,592	-0,890	-0,702	-0,891
MAR	-0,377	0,128	0,139	-0,592	1	0,667	-0,035	0,836
DIV	-0,553	0,621	0,550	-0,890	0,667	1	0,440	0,898
WES	-0,769	0,871	0,462	-0,702	-0,035	0,440	1	0,375
ISR	-0,588	0,514	0,330	-0,891	0,836	0,898	0,375	1

Note: compiled by the author

Based on the presented results, the following conclusions were drawn.

Kindergarten (PRE3)

There is a strong negative correlation (r = -0.878) between the share of children under 3 who attend kindergarten and the gender pay gap. It suggests that extending access to preschool education provides women with the opportunity for full-time employment and career growth, and as a result, reduces the gender pay gap. Additionally, it demonstrates an improvement in work-family balance. Moreover, the strong negative relationship with part-time employment (r = -0.815) may shrink the necessity for women to work part-time and involve women in full employment. Thus, the expansion of preschool infrastructure is a crucial factor in overcoming structural barriers to women's employment.

Part-time employment (WPT)

The revealed positive correlation between the share of women working part-time and the gender pay gap (r = 0.811) suggests that it contributes to an increase in the pay gap. A strong negative correlation between part-time employment of women and the number of divorces (r = -0.890) shows that as the proportion of women working part-time decreases, the divorce rate increases. Increases in women's full-time employment may be accompanied by increased economic independence, which in turn reduces financial dependence on a partner and makes divorce more socially and financially feasible. Changing gender roles in the family and the redistribution of responsibilities between spouses can create additional stress in households where both partners work full-time.

Women applying to employment services (WES)

There is a negative correlation (r = -0.769) between the number of women applying to employment services and the gender pay gap. As the number of women applying to employment agencies increases, the gender wage gap decreases. The increase in women's requests for employment support may indicate a more active integration of women into the formal labour market, which contributes to the improvement of their economic situation. Employment agencies, especially those with retraining and vocational development programmes, can reduce barriers to high-paying or skilled employment, thereby helping to narrow the gender income gap. In addition, it may reflect increased awareness and activity among women in seeking equal opportunities, which also affects the overall wage structure between the sexes.

Income-to-Subsistence Ratio (ISR)

There is a moderate negative correlation with the gender pay gap (r = –0.588), indicating that an increase in women's income is associated with a reduction in the gender gap. A strong negative correlation is observed with women working part-time (r = –0.891). As women's income grows, the share of those working part-time decreases, likely because they transition to full-time employment.

The observed correlations support the need for increased investment in the preschool education system, the expansion of retraining programs, and the promotion of full-time employment for women as strategic measures to reduce gender inequality in the labour market. These findings highlight the importance of addressing both structural and institutional factors to ensure women's equal access to economic opportunities and long-term financial security.

5. CONCLUSIONS

The research examined the impact of maternity leave, part-time employment, and access to preschool education on the gender pay gap and gender inequality in the labour market in Kazakhstan. It was revealed that structural and cultural barriers limit the economic activity of women.

Maternity is a key factor that strengthens women's economic vulnerability. Insufficient access to kindergartens leads to career breaks, an increase in the share of part-time and informal employment, and, consequently, the accumulation of the motherhood penalty (Mourao, 2013). Part-time employment, despite its flexibility, limits career development opportunities and is associated with lower income, thereby exacerbating gender inequality (Hirsch, 2005).

Despite achievements in legislation and parity in education, economic inequality between women and men persists. The gender pay gap in Kazakhstan is decreasing; however, it remains significant. The correlation matrix revealed the factors that most influence inequality.

Regarding RQ1, it confirms that the maternity penalty significantly impacts female employment in Kazakhstan. The correlation analysis reveals a strong negative relationship between the availability of preschool education for children under the age of 3 and the gender pay gap (r = –0.878), as well as with the rate of women working part-time (r = –0.815). Access to preschool education for children under the age of 3 significantly reduces the gender income gap and decreases the share of women working part-time. Preschool infrastructure is essential for women's participation in the labour market. It also helps women return to employment more quickly and reduces the motherhood penalty (Berlinski & Galiani, 2007). Affordable and accessible preschool services for children under 3 are especially relevant for women with low and medium income levels, who cannot afford private kindergartens or nannies. Consequently, the lack of early childcare options acts as a structural barrier to women's sustained economic engagement and career progression. Therefore, the expansion of preschool education is both a social and economic measure to reduce gender inequality, increase employment, and support women's economic empowerment.

Regarding RQ2, the results confirm that part-time employment among women relates to gender income inequality. The analysis reveals a strong positive correlation between part-time jobs and the gender pay gap (r = 0.811). Women working part-time face limited career growth opportunities and lower income, which makes them economically vulnerable (Antonie et al., 2020). While flexible schedules help achieve work–family balance, they often come at the cost of social protections, limited access to professional development, and reduced long-term security. In the long run, this leads to lower pension savings, accumulated economic loss, and growing inequality both during working age and into retirement. Therefore, reducing involuntary part-time employment should be a priority in gender-sensitive employment policy.

Regarding RQ3, the results confirm that

employment services reduce the gender pay gap. A negative correlation was found between the number of women applying to employment services and the gender pay gap (r = –0.769). The application of women to employment services can be interpreted as a positive factor contributing to increased formal employment and enhanced opportunities for women's professional development. The support provided by employment centres such as retraining programs, career consulting, and job placement assistance fosters women's active participation in the formal economy and helps reduce economic inequality between the sexes.

An increase in women's income relative to the cost of living is accompanied by a decrease in the share of part-time employment and a reduction in the gender pay gap. Economic stability enables women to transition into more sustainable, full-time, and socially protected forms of employment, decreasing their reliance on unstable and low-paid jobs. In the long term, this also strengthens their economic autonomy and reduces the risks of social vulnerability.

Moreover, there is an evident expansion of women's participation in business. The share of enterprises led by women has shown a steady increase. This trend may indicate adequate state support for female entrepreneurship, improved access to financial and educational resources, and changing public perceptions of gender roles in business.

Addressing gender inequality requires a systematic and intersectoral policy approach aimed at eliminating institutional and cultural barriers. The following measures should be prioritised:

(1) Development of infrastructure for preschool education, especially for children under the age of three;

(2) Promotion of formal and flexible employment (including remote work and part-time jobs with social protection);

(3) Expansion of professional development, retraining programs, and support for women's reintegration into the labour market;

(4) Reduction of gender segregation in employment sectors.

In general, the implementation of these measures would contribute to narrowing the gender pay gap, strengthening women's economic independence, increasing formal employment, and ensuring sustainable, inclusive growth aligned with the Sustainable Development Goals (SDG 5).

AUTHOR CONTRIBUTION

Writing – original draft: Kuralay Nurgaliyeva.
Conceptualization: Kuralay Nurgaliyeva.
Formal analysis and investigation: Kuralay Nurgaliyeva.
Development of research methodology: Kuralay Nurgaliyeva.
Resources: Kuralay Nurgaliyeva.
Software and supervisions: Kuralay Nurgaliyeva.
Data collection, analysis and interpretation: Kuralay Nurgaliyeva.
Visualization: Kuralay Nurgaliyeva.
Writing review and editing research: Kuralay Nurgaliyeva.

REFERENCES

Abe, Y. (2013). Regional variations in labor force behavior of women in Japan. *Japan and the World Economy, 28,* 112–124. https://doi.org/10.1016/j.japwor.2013.08.004

Akgunduz, Y. E., & Plantenga, J. (2018). Child care prices and maternal employment: A meta-analysis. *Journal of Economic Surveys, 32*(1), 118–133. https://doi.org/10.1111/joes.12192

Antonie, L., Gatto, L., & Plesca, M. (2020). Full-time and part-time work and the gender wage gap. *Atlantic Economic Journal, 48,* 275–293. https://doi.org/10.1007/s11293-020-09677-z

Baker, M., & Drolet, M. (2010). A new view of the male/female pay gap. *Canadian Public Policy, 36*(4), 429–464. https://doi.org/10.3138/cpp.36.4.42
Berlinski, S., & Galiani, S. (2007). The effect of a large expansion of pre-primary school facilities on preschool attendance and maternal employment. *Labour Economics, 14*(3), 665–680. https://doi.org/10.1016/j.labeco.2007.01.003
Berthelon, M., Kruger, D., Lauer, C., Tiberti, L., & Zamora, C. (2024). Longer school schedules, childcare and the quality of mothers' employment. *Economic Policy, 39*(120), 817–846. https://doi.org/10.1093/epolic/eiae037
Blau, D., & Currie, J. (2006). Pre-school, day care, and after-school care: Who's minding the kids? In E. Hanushek & F. Welch (Eds.), *Handbook of the economics of education* (Vol. 2, pp. 1163–1278). Elsevier. https://doi.org/10.1016/S1574-0692(06)02020-4
Bureau of National Statistics. (2024). *Bureau of National Statistics of the Republic of Kazakhstan.* https://stat.gov.kz/en
Buribayev, Y. A., & Khamzina, Z. A. (2019). Gender equality in employment: The experience of Kazakhstan. *International Journal of Discrimination and the Law, 19*(2), 110–124. https://doi.org/10.1177/1358229119846784
Constitutional Law of the Republic of Kazakhstan. (2024). *On elections in the Republic of Kazakhstan: Constitutional Law No. 2464 of September 28, 1995 (as amended on January 1, 2024).* https://online.zakon.kz/Document/?doc_id=1004029
Dickens, W. T., & Lang, K. (1993). Labor market segmentation theory: Reconsidering the evidence. In W. Darity (Ed.), *Labor economics: Problems in analyzing labor markets* (pp. 141–180). Springer. https://doi.org/10.1007/978-94-011-2938-1_6
Folke, O., & Rickne, J. (2020). All the single ladies: Job promotions and the durability of marriage. *American Economic Journal: Applied Economics, 12*(1), 260–287. https://doi.org/10.1257/app.20180435
Ghilarducci, T., & Lee, M. (2005). Female dual labour markets and employee benefits. *Scottish Journal of Political Economy, 52*(1), 18–37. https://doi.org/10.1111/j.0036-9292.2005.00332.x
Hirsch, B. T. (2005). Why do part-time workers earn less? The role of worker and job skills. *Industrial and Labor Relations Review, 58*(4), 525–551. https://doi.org/10.1177/001979390505800404
Kenzheali, Y., Kenzhegulova, G., Kireyeva, A., & Ainakul, N. (2024). Assessing gender differences in managerial roles, wages, education, and soft skills in Kazakhstan. *Problems and Perspectives in Management, 22*(3), 341–357. https://doi.org/10.21511/ppm.22(3).2024.27
Kleven, H., Landais, C., & Sogaard, J. E. (2019). Children and gender inequality: Evidence from Denmark. *American Economic Journal: Applied Economics, 11*(4), 181–209. https://doi.org/10.1257/app.20180010
Kolesnik, D. P., Pestova, A. A., & Donina, A. G. (2021). What should we do about the employment of women with children in Russia? The role of preschool educational institutions. *Voprosy Ekonomiki, 12,* 94–117. https://doi.org/10.32609/0042-8736-2021-12-94-117
Loughran, D. S., & Zissimopoulos, J. M. (2009). Why wait? The effect of marriage and childbearing on the wages of men and women. *Journal of Human Resources, 44*(2), 326–349. https://doi.org/10.1353/jhr.2009.0032
Manning, A., & Robinson, H. (2004). Something in the way she moves: A fresh look at an old gap. *Oxford Economic Papers, 56*(2), 169–188. https://doi.org/10.1093/oep/gpf039
Meara, K., Pastore, F., & Webster, A. (2020). The gender pay gap in the USA: A matching study. *Journal of Population Economics, 33*(1), 271–305. https://doi.org/10.1007/s00148-019-00743-8
Mourao, P. R. (2013). Women out, children out: The effect of female labor on Portuguese preschool enrollment rates. *Emerging Markets Finance and Trade, 49*(Suppl. 1), 49–62. https://doi.org/10.2753/REE1540-496X4901S104
Nugmanova, M., Meurs, M., & Lipovka, A. (2025). Care for very young children and the employment of mothers in Kazakhstan. *International Journal of Care and Caring.* Advance online publication. https://doi.org/10.1332/23978821Y2025D000000138
Ojong, N., Simba, A., & Dana, L. P. (2021). Female entrepreneurship in Africa: A review, trends, and future research directions. *Journal of Business Research, 132,* 233–248. https://doi.org/10.1016/j.jbusres.2021.04.032

Polachek, S. W. (2014). Equal pay legislation and the gender wage gap. *IZA World of Labor.* https://doi.org/10.15185/izawol.16
Rzhanitsyna, L. S. (2000). Работающие женщины в России в конце 90-х годов [Working women in Russia in the late 1990s]. *Voprosy Ekonomiki, (3),* 46–53.
Schrenker, A. (2023). Do women expect wage cuts for part-time work? *Labour Economics, 80,* 102291. https://doi.org/10.1016/j.labeco.2022.102291
Tomaskovic-Devey, D., & Skaggs, S. (2002). Sex segregation, labor process organisation, and gender earnings inequality. *American Journal of Sociology, 108*(1), 102–128. https://doi.org/10.1086/344214

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RESEARCH ARTICLE
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A Statistical Study of Kazakhstan's Gender Employment Gaps' Stability in 2014-2024

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Abstract

Today in Kazakhstan, there are still imbalances between men and women in the labour market. The purpose of the study is to determine the level and sustainability of gender differences in employment in Kazakhstan based on the analysis of selected factors using the methods of correlation, regression and cluster analysis. The research uses methods of descriptive statistics, correlation analysis, linear regression and K-means clustering. The initial data for the study were obtained from official statistical sources of the Bureau of National Statistics of the Republic of Kazakhstan and include annual employment figures for men and women. Regression analysis ($R2 < 0.05$, $p > 0.1$) confirmed the absence of statistically significant upward or downward trends, indicating a structural and persistent gender gap. Correlation analysis revealed moderate positive associations between male employment and the share of industry and education in GDP ($r = 0.38$-0.43), while female employment was less correlated with the agricultural sector ($r = 0.28$). Data clusterisation divided the study period into two clusters of years with relatively low and high macroeconomic indicators. The results obtained confirm that gender inequality in employment in Kazakhstan has a structural and institutional nature and does not decrease automatically with economic growth. Future research areas include the development of models for assessing the impact of social norms, family policy, and digitalisation on women's employment.

Keywords: Gender, Gender Employment, Gender Economy, Discrimination, Labour Market, Women's Employment, Career Development

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JEL Code: J16, J21, O15

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1. INTRODUCTION

Gender discrimination in the workplace remains one of the most persistent problems in all labour markets around the world. Although overall trends in labour force participation have flattened in most countries, differences between men remain a reflection of entrenched social, economic and institutional structures. In the post-Soviet economies of Kazakhstan and other countries, economic restructuring created new inequalities as well as new opportunities as economic transformation changed the structure of employment in different sectors and at various levels. It is therefore necessary to understand the general trend in women's and men's work so that the trend towards equality can be examined, and what obstacles lie ahead to limit women's participation in the labour market.

Kazakhstan represents a special case in the study of gendered labour patterns. Thanks to sustained economic growth over the last decade and structural investment in industry and education in particular, a gap between men and women in the workplace still exists. According to official statistics, men's employment is higher than women's in all cases, raising significant questions as to why the gap has not narrowed. Although short-term trends may reflect episodic economic shocks, such as the 2015 oil price shock or the 2020 pandemic, it is unclear whether these shocks have affected employment inequality or whether the gender gap is relatively stable in the long term. The persistence of these imbalances suggests that gender discrimination in employment is not simply a consequence of temporary economic difficulties but is supported by the structural and institutional features of the national labour market. Occupational segregation, limited access to high-wage industries, and unequal distribution of household labour continue to impact women's labour force participation. The link between economic growth and social norms also helps to reinforce this asymmetry in the sense that progress in industrial development and education does not directly equalise the corresponding levels of employment. Thus, an assessment of labour order in Kazakhstan will only be complete when quantitative indicators are included along with the sociocultural determinants that reinforce gendered labour hierarchies.

Moreover, long-term analysis of labour stability through statistical modelling can identify systemic trends that go beyond cyclical trends. Through correlation, regression and cluster analysis, this study places gender inequality in employment within its institutional framework so that even during times of economic recovery or change, labour imbalances are believed to remain stable. This analytical approach highlights the need for targeted interventions at organisational and policy levels, aiming not only to increase women's access to the labour force but also to transform the institutional arrangements that support unbalanced participation. The results thus contribute to the overall conversation about sustainable and equitable economic growth by demonstrating that gender balance in the workforce requires more than a legal framework - it involves a transformation of the distribution of opportunities in the new financial landscape.

The purpose of the study is to identify the nature and sustainability of gender differences in employment in Kazakhstan based on selected factors through the use of correlation, regression and cluster analysis. The study uses descriptive statistics to determine employment levels, correlates employment levels with patterns, and performs regression analysis to analyse long-term trends and stability. Cluster analysis to identify structural groups of years with similar economic and employment characteristics. Using these methods, the study will focus on addressing three key issues: (1) men's performance is never higher than women's, (2) manufacturing performance is sustained and, surprisingly, over the long term, and (3) whether gender differences have changed over the observed decade.

This article contributes to the scholarly literature on labour market inequality by offering a comprehensive statistical analysis of gendered labour in Kazakhstan, which has been the subject of intense research interest for more than a decade. He constructs gender inequality in temporal and structural terms, explaining that inequality not only continues to exist, but is actually embedded in broader economic forces. The findings have policy implications, suggesting that economic growth alone is insufficient to counteract gender inequality, and concrete measures are needed to achieve equal participation in the labour market.

2. LITERATURE REVIEW

A significant body of evidence addresses gender inequality in labour markets and identifies it with broader economic, institutional and cultural mechanisms. Scientists have debated for decades whether gender differences reflect differences in productivity at the individual level or systemic barriers rooted in social and economic structures. Theoretical and empirical approaches have evolved, from early human capital models to sophisticated institutional and econometric models that identify structural inequalities across space and time.

The intellectual origins of such debates go back to classical human capital theory, developed in the second half of the twentieth century. Becker (1991) and Mincer (1974) viewed education and experience as investments that increase people's productivity levels and argued that differences in wages and employment between women and men reflect, to a large extent, differences in the accumulation of human capital. Later developments of this model, such as extended neoclassical models (Lucas, 1988; Romer, 1990; Mankiw et al., 1992), emphasised the fact that education and skills are the engines of economic growth. However, these models have been criticised for being quantitative in nature, as they tend to underestimate the social and institutional dimensions of gender inequality (Acker, 1990). Researchers have realised that markets themselves can reproduce inequalities if they are based on asymmetric access, cultural codes and labour segmentation. In the 1990s, attention turned to transition economies as market liberalisation changed employment systems. Ogloblin (1999) proved that the post-Soviet transformation increased occupational segregation, and women took up low-paid and insecure social professions. Coudouel and Marnie (1999) found that women became more likely to work part-time and informally, while men were employed in industrial and technical occupations. Brainerd (2000) demonstrated that market reforms increased gender employment and wage inequality in Eastern Europe and the former Soviet Union, as privatisation disproportionately benefited men. Ashwin (2002) noted that family gender and traditional beliefs continue to limit women's participation in formal employment. Paci (2002) reached the same conclusion, finding a double pattern of inclusion: women's high levels of education are followed by exclusion from managerial and industrial occupations.

By the mid-2000s, the evidence was leaning toward institutional explanations. Reva (2005) noted that even during the years of economic recovery, women in Kazakhstan and other transition countries remained concentrated in low-wage social sectors, while men controlled high-productivity sectors. Heyat (2006) emphasised that gender stereotypes and societal expectations limit women's professional mobility. Reports by the International Labour Organisation (2004) and UNDP (2009) confirm that legal equality is not being respected due to inadequate institutions and poor enforcement. The World Bank (2008) found that women's employment in Kazakhstan declined during structural adjustment, and economic growth alone could not eradicate gender inequality. Taken together, these articles demonstrate that inequality persists because economic and legal reforms have not fundamentally altered deeply ingrained social and institutional values.

The 2010s saw a methodological shift towards econometric and data-driven research. Blau et al. (2017) showed that, despite high-income countries, gender inequality persists due to occupational segregation and unequal distribution of unpaid domestic labour. Meurs et al. (2021) characterised the Kazakh labour market as a “gender regime” that combines Soviet institutional legacies with market discrimination, resulting in women's monopoly in low-paid social professions such as education and medicine. Qi (2023) used data mining techniques to examine job stability among college graduates and determined that gender plays a huge role in work conditions, with women experiencing longer job search durations and less job stability. Flynn et al. (2024) explained that gender differences in wages and employment arise not only from differences in productivity but also from behavioural asymmetries and employer discrimination. Nurbatsin et al. (2024) showed that occupational segregation is the most significant source of wage inequality in Kazakhstan, and Kuanova et al. (2024) showed that women’s employment is more sensitive to macroeconomic shocks, despite improvements in the quality of employment.

At the global level, OECD (2020) reports and comparative analyses highlight that gender inequalities remain deeply structural. Despite increases in educational attainment and formal equality, women’s representation in high-productivity occupations lags behind that of men due to persistent institutional and cultural barriers. These results support earlier research by Blau et al. (2000) and further support the view that gender differences are embedded in long-term structural configurations rather than short-term economic fluctuations.

Overall, the literature reviewed in this article shows the same trend over the decades from the 1970s to the 2020s: gender inequality in employment persists despite economic modernisation, educational progress, and policy reform. Neoclassical models provide practical explanations of individual differences, but institutional and structural models are better at explaining the persistence of inequality over time. For Kazakhstan and other countries with economies in transition, gender differences are determined not by fleeting distortions but by sustainable institutional mechanisms. This study builds on this literature and applies descriptive, correlation, regression and cluster analyses to assess the persistence and determinants of gender inequality in employment in Kazakhstan for 2014-2024.

3. RESEARCH METHODS

Employment stability by gender in Kazakhstan in the period 2014-2024. The data is analysed in this book using a general quantitative approach, including descriptive, correlation, regression, and cluster analysis. In developing the methodology, every effort was made to take into account both the temporal and structural aspects of gender inequality in employment, and to determine whether macroeconomic conditions influence the employment rates of men and women separately or not.

A systematic approach provides methodological consistency to the study and helps move from data preparation to statistical interpretation. As shown in Figure 1, the study uses a consistent methodological sequence with five stages of analysis: data collection, descriptive and trend analysis, correlation analysis, regression and clustering models, and final interpretation.

The evidence is based on annual observations of the sex and age group of men and women of working age (in percentage) and macroeconomic indicators of the sectoral structure of the economy, i.e. the percentage share of agriculture, industry and education in gross domestic product (GDP). These were chosen because they reflect both the structural composition of the national economy and the composition of employment across broad sectors.

Before statistical testing, all variables were checked for consistency, precision, and completeness. Continuous variables were standardised to ensure comparability of scales and to prevent bias in multivariate analyses. Preprocessing ensured consistency of subsequent correlation and clustering operations.

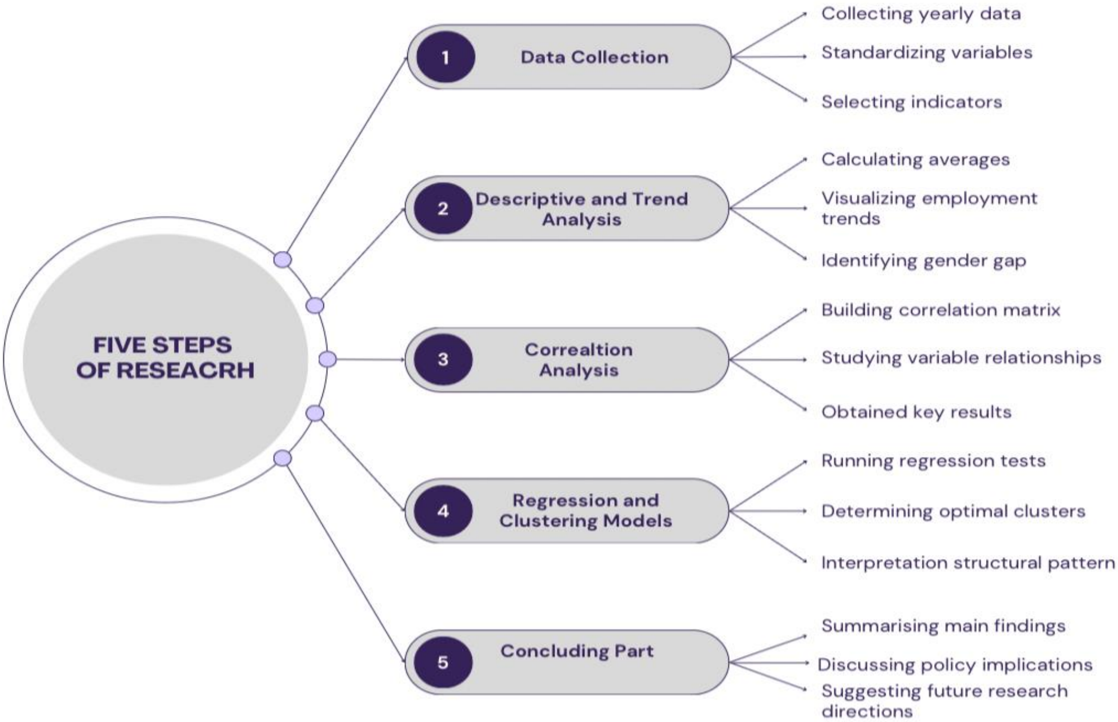


FIGURE 1. The scheme of the sequential steps of research

In this case, the variables were divided into two blocks of concepts: (1) employment indicators by gender, that is, Fem_Empl, Male_Empl, Gender_Gap, which reflect quantitative as well as structural differences in the labor force; and (2) economic structure indicators Agri_GDP, Ind_GDP, Educ_GDP, respectively, which reflect sectoral value added to GDP and reflect changes in employment in the future.

The Gender_Gap variable was defined as the difference in the employment rates of men and women and was used as the leading indicator of gender inequality in the labour market. The Clusters variable documents structural clusters obtained using K-means clustering, which divided the observation period into two regimes with contrasting macroeconomic conditions and employment status.

Analysis variables, units of measurement, and data sources are listed in Table 1.

TABLE 1. Variables indicating units of measurement and data sources

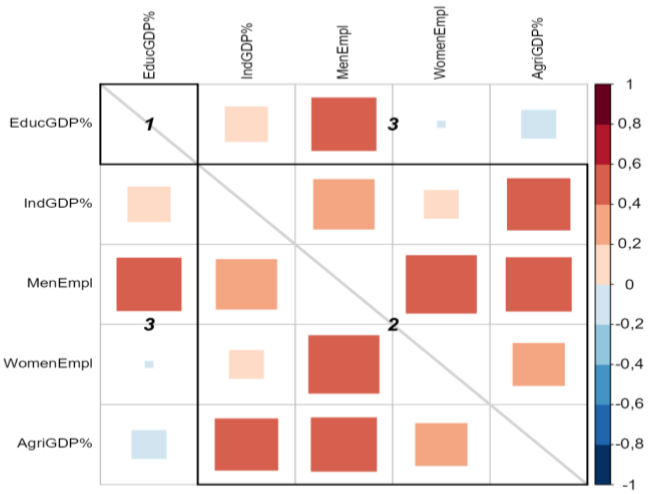
Code	Variable	Unit of measurement	Data source
Fem_Empl	Employment rate of women	Percentage of total working-age female population	Bureau of National Statistics (2024)
Male_Empl	Employment rate of men	Percentage of total working-age male population	Bureau of National Statistics (2024)
Agri_GDP	Share of agriculture in GDP	Percentage of GDP	Bureau of National Statistics (2024)

Ind_GDP	Share of industry in GDP	Percentage of GDP	Bureau of National Statistics (2024)
Educ_GDP	Share of education in GDP	Percentage of GDP	Bureau of National Statistics (2024)
Gender_Gap	Difference between male and female employment rates	Percentage points	Calculated by authors based on Bureau of National Statistics (2024)
Clusters	Structural grouping by economic and employment indicators	Cluster index (1–2)	Calculated by authors using K-means clustering
Year	Observation year	2014–2024	Bureau of National Statistics (2024)

Note: compiled by the authors based on the Bureau of National Statistics (2024)

Descriptive statistics were used to describe gender patterns of employment over time. Trend analysis was also used to present trends in women's and men's employment over the course of a decade, and to determine whether changes reflected a cyclical or long-term pattern. Correlation analysis was then used to assess the direction and strength of the relationship between employment levels and macroeconomic indicators. The Pearson correlation matrix at the 95% confidence level was used to determine the relationships between female and male employment levels and the sectoral components of GDP - education, industry and agriculture. Separate linear regressions were estimated for male and female employment rates, with Year as the explanatory variable. Slope coefficients close to zero confirmed the absence of statistically significant upward or downward trends, implying that gender inequality in employment is a structural feature of the Kazakhstan labour market rather than a function of cyclical conditions.

Finally, cluster analysis was used to determine employment and macroeconomic structural patterns. Using the K-means algorithm, the optimal number of clusters was determined using the elbow method, in which the within-cluster sum of squares (WCSS) curve showed a characteristic inflexion point at k = 2. As shown in Figure 2, the result indicates two broad structural regimes: years of relatively low employment and weaker macroeconomic performance, and years of higher employment and more substantial contribution to industry and education.



K-means Clustering

Instructions

Clustering vector

Sum of Squares Table

	Value
Cluster 1	20.7
Cluster 2	14.4
Between clusters	20.0
Total	55.0

FIGURE 2. Correlation matrix

As shown in Figure 3, the cluster plot graphically illustrates these two modes. Confirmation that the observed differences are not spurious, but systematic, is the identification of clusters. Even within the high-performing cluster, the employment rate of men is still higher than that of women, which confirms the fact that gender discrimination in the labour market of Kazakhstan exists even with and without good and bad periods in the economy.

Overall, this mixed methodological framework, combining descriptive, correlation, regression and cluster analysis, provides a strong basis for studying the temporal stability and structural persistence of gender inequality in the labour market. The results obtained using this approach provide a comprehensive description of how economic modernisation intersects with long-standing institutional and social processes in the labour market of Kazakhstan.

4. RESULTS

To assess the interrelationships between gendered employment rates and the structural composition of Kazakhstan's economy, a correlation analysis was conducted using annual data for 2014–2024. This stage of the study aimed to identify the direction and strength of associations between male and female employment levels and the sectoral shares of agriculture, industry, and education in GDP. Pearson's correlation coefficients were calculated to measure linear relationships among these variables, while 95% confidence intervals and p-values were employed to evaluate the statistical robustness of the results. The correlation matrix summarizing these relationships is presented in Table 2, which provides a comprehensive overview of how employment patterns among men and women are connected to the broader structure of the national economy.

TABLE 2. Correlation analysis

Code	Meaning	FemEmpl	MaleEmpl	AgriGDP	IndGDP	EducGDP
FemEmpl	Pearson's r	-	-	-	-	-
	95% CI Lower	-	-	-	-	-
	95% CI Upper	-	-	-	-	-
	p-value	-	-	-	-	-
MaleEmpl	Pearson's r	0.518	-	-	-	-
	95% CI Lower	-0.119	-	-	-	-
	95% CI Upper	0.853	-	-	-	-
	p-value	1.000	-	-	-	-
AgriGDP	Pearson's r	0.277	0.447	-	-	-
	95% CI Lower	-0.387	-0.209	-	-	-
	95% CI Upper	0.752	0.825	-	-	-
	p-value	1.000	1.000	-	-	-
IndGDP	Pearson's r	0.121	0.384	0.412	-	-
	95% CI Lower	-0.516	-0.280	-0.250	-	-
	95% CI Upper	0.672	0.800	0.811	-	-
	p-value	1.000	1.000	1.000	-	-
EducGDP	Pearson's r	-0.006	0.433	-0.123	0.187	-
	95% CI Lower	-0.604	-0.226	-0.673	-0.465	-
	95% CI Upper	0.596	0.820	0.515	0.708	-
	p-value	1.000	1.000	1.000	1.000	-
* p < .05, ** p < .01, *** p < .001 Simultaneous multiple correlation comparisons using BY method						

Note: compiled by the authors

The correlation matrix contains a quantitative resume of the level of employment of men and women and structural components of GDP, that is, agriculture, industry and education. Although none of the coefficients were statistically significant within the framework of ordinary standards, the matrix is still helpful in understanding the potential models of the association. The correlation between the employment levels of men and women was moderately positive (R = 0.518) over the decade of 2014-2024. An increase in the employment of men, as a rule, tended to coincide with an increase in women's employment. This suggests that both sexes can be susceptible to the same forces, such as long-term growth or recession, although the correlation is not particularly strong.

Although further discussion is considered below when labour is compared with the GDP structure, more differentiated patterns emerge. Male employment had a stronger correlation with the share of the industry GDP (R = 0.384) and the cost of education as a share of GDP (R = 0.433). This suggests that men's work may be more closely related to industries that require safe, official employment opportunities, such as industry and state education. Women's labour, on the other hand, had a moderate but positive correlation with agriculture (R = 0.277), which may reflect more women in seasonal or informal employment on the farm. Although the statistical significance was absent in these associations, the direction of the coefficients suggests significant structural relationships. These results indicate that, although men and women are collectively affected by trends, their individual components of the economy can have a direct impact on their employment status.

Between 2014 and 2024, the regression of men's employment indicates that the level of employment has remained relatively constant over the years. The installed regression line has a minimal slope, indicating that there was no strong long-term trend, either up or down. This suggests that, despite fluctuations in the national economy, including the collapse of world oil prices in 2015 and the onset of the Covid-19 pandemic in 2020, the overall level of employment among men remained relatively unchanged. Instead, male employment, by the same measure, was recorded at a relatively high level, which is consistent with the continuity of men in labour.

This is important because it implies the stability of men's employment in the face of economic shocks. Although a short-term decrease or increase may occur in some years, the regression analysis clearly indicates that these fluctuations do not result in structural changes. Regarding the hypotheses in the study, the results strongly support Hypothesis 2, which suggests that employment indicators are relatively stable over time. In addition, since the employment of men is always greater than that of women in every observed year, this regression also indirectly confirms hypothesis 1, which emphasises the continuity of gender distinction.

The regression of employment levels between the same years reveals a similar stability pattern, albeit at lower levels over time than is immediately apparent to men. The tilt of the regression line is approximately zero, indicating no significant trend over time. This confirms that the employment of women did not increase or decrease significantly during the period, but remained stable. It should be especially noted that the absolute level of women's employment by several percentage points is lower than that of men in every year, and that this confirms the presence of a constant gender gap.

The constancy of women's employment in the context of structural economic changes suggests that the cyclic nature of the economy does not limit the presence of women in the labour market, but rather by more sustainable institutional and social factors. For example, gender roles, family responsibilities and the employment industry can limit the scale for a significant increase in women's employment coefficients. In 2020, during the COVID-19 pandemic, when it was expected that the care sector would be disproportionately affected by women, there was no observed structural decline in the regression model. This suggests that the gender gap has deep roots and is less susceptible to short-term fluctuations. This regression confirms hypothesis 1, indicating that men have a higher level of employment compared to women, and also confirms hypothesis 2, demonstrating stability in women's employment levels during the observation period (Table 3).

TABLE 3. Regression of the gender gap per year

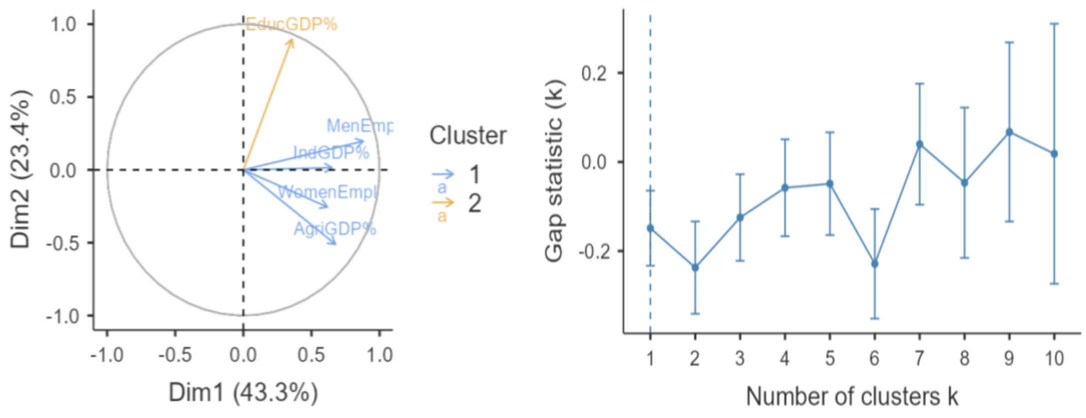
No.	WomenEmpl	MenEmpl	AgriGDP	IndGDP	EducGDP
1	-0.500	-0.518	-0.505	-0.489	-0.159
2	0.875	0.906	0.884	0.856	0.278

Note: compiled by the authors

The regression analysis of the gender gap in employment, that is, the difference in employment levels between men and women, also explains the persistence of inequality. The regression line indicates that there is no significant inclination, meaning the size of the gap has remained constant during the period from 2014 to 2024. Therefore, the results decisively confirm Hypothesis 3, namely, that the gender gap persists over time with minimal changes.

Such stability is especially intriguing, since it suggests that gender discrimination in the labour market is not just a fleeting phenomenon or the result of temporary economic fluctuations. Instead, this, according to the visible, is rather a structural feature of the Kazakh market. The fact that the gap has persisted for eleven years emphasises the need to consider the inequality of employment as a result of deeply ingrained institutional and social forces, rather than as a temporary episode. It also assumes that, in the absence of direct political intervention, including a policy to expand women's presence in safe employment, the gap is unlikely to be closed in the future. Therefore, the regression results not only confirm the hypotheses but also yield important implications for political discourse.

As shown in Figure 3, clustering by the K-means method allowed us to identify two structural modes of the labour market in Kazakhstan, corresponding to years with low and high employment rates.



Employment clustering and economic indicators *Optimal number of clusters*

FIGURE 3. Employment clustering and determination of the optimal number of clusters

A multidimensional addition to the study, analysis of K-medium group clustering groups for two clusters based on standardised values of men's employment, women's employment, and indicators of sector GDP. Cluster 1 is characterised by relatively lower employment and economic indicators, while Cluster 2 is characterised by higher employment levels and improving indicators. This dichotomisation suggests that the employment experiences of women and men are not entirely independent of the broader economic situation. Instead, the improved years of industry performance, especially in industry and education, will be associated with improved employment levels for both men and women.

Closure-centred also distinguishes these differences. Cluster 2 has values higher than the average for both men and women, as well as contributions to agriculture, industry, and education in GDP that exceed the average. Cluster 1 has values below the average for each of the variables. However, what is most important, even within the highly effective cluster, a gender gap in employment remains, assuming that although both groups benefit from any reduction in deficiency, structural inequality is not solved. Thus, the results of clustering confirm regression, showing that the stability of the gender gap is maintained across various economic conditions.

The “elbow method” was applied to determine the optimal number of clusters in the K-means analysis. As shown in Figure 3, the curve represents the relationship between the number of clusters (k) and the within-cluster sum of squares (WCSS). The curve has an obvious inflexion point at k = 2, after which further increases in the number of clusters produce only a slight reduction in intra-cluster variance. This elbow indicates that the two-cluster solution provides the most parsimonious and interpretable model of the data, striking a balance between model simplicity and explanatory power.

The meaning of the opening is twofold. Statistically, this confirms that employment and performance in Kazakhstan between 2014 and 2024 will naturally cluster into two structurally coherent categories. Significantly, this suggests the existence of two distinct regimes for work during the observed period: one characterised by relatively lower employment rates and sectoral contribution to GDP, and another with higher economic performance and employment for both men and women. This structural dichotomy supports the assumption that the labour market in Kazakhstan is undergoing alternating phases of comparative economic strength and weakness, but without a significant change in gender employment deficits.

Furthermore, the two-dimensional K-means cluster plot in Figure 4 provides a visual representation of the differences between the identified groups.

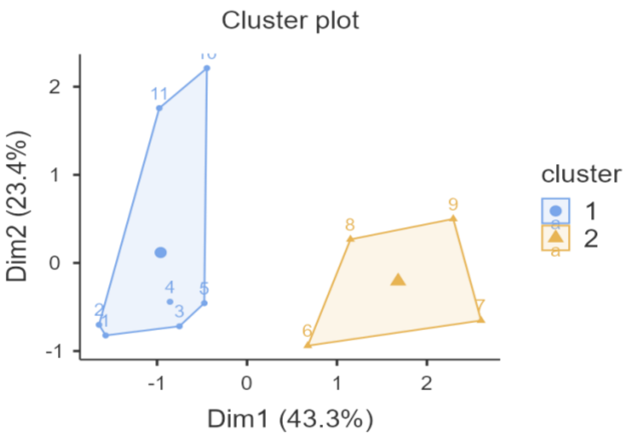


FIGURE 4. Cluster plot

The points on the graph represent separate annual observations from 2014 to 2024, displayed on standardised employment of men and women and related indicators (share of agriculture, industry, and education in GDP).

The visual separation between cluster 1 and cluster 2 is significant, which confirms the significance of the classification detected at the elbow point. Cluster 1 identifies years with low employment for both sexes and weaker indicators, particularly in the industry and education sectors. Cluster 2 identifies the years with better employment and increased sectoral contributions to GDP, reflecting periods of higher aggregate economic activity.

However, the most significant fact is that the gender gap in employment persists within each cluster. Even within a highly effective cluster, the level of employment of men consistently exceeds that of women, confirming the study's assertion that structural gender inequality in Kazakhstan's labour market is stable and resilient to fluctuations. Thus, the cluster schedule not only verifies the quantitative result of the regression and correlation analysis, but also graphically confirms that gender differences are inalienable characteristics of both economic regimes, rather than cyclic or short-term phenomena.

5. DISCUSSION

The findings of this study confirm gender-based labour discrimination in Kazakhstan as widespread and endemic to the country's labour market. During the observed period (2014–2024), men's employment rates consistently exceeded those of women, and the gap remained statistically stable even after accounting for the impact of fluctuations in conditions. Regression analysis revealed that the employment levels of men and women did not exhibit severe growth or decline trends, indicating that gender differences are structurally persistent and not cyclic or ephemeral. The persistence of inequality across booms, busts, and recessions illustrates that cumulative shocks such as the 2015 oil price crisis and the 2020 COVID-19 pandemic did not significantly alter employment gender outcomes.

Correlation analysis provided further evidence of structural differentiation in the labour market in Kazakhstan. Men's employment indicated a stronger relationship with the industrial and educational sectors, and women's employment was weakly correlated with agriculture. This trend is consistent with the long-term occupational segregation that Nurbatsin and Kurmasheva (2024) and Meurs et al. Although the correlation coefficients were not found to be statistically significant, the direction of the trend suggests that growth alone has not led to more balanced gender employment opportunities. The cluster analysis also confirmed these conclusions. Of course, the data fell into two structural clusters: one is associated with weaker indicators and employment, and the other is associated with improving economic indicators and employment over the years. Despite these differences, gender differences have been preserved in both samples and confirm the statement that structural inequality is not related to the general economic level. This is consistent with the statement by Kuanova and Anissa (2024), who noted that the nature of employment for women has not increased in proportion, as there are persistent institutional and cultural barriers.

In combination with international data, these results confirm the work of Flynn, Todd, and Zhang (2024), which demonstrated that the institutional and behavioural asymmetry of influences, and not differences in performance, are responsible for most of the documented gender gap in remuneration in the labour market. Similarly, Qi (2023) demonstrated that even among new participants in the labour force, women face a more prolonged job search and fewer stable employment opportunities, illustrating how inequality is reproduced from the outset of their working lives. The preservation of such inequality in Kazakhstan confirms the characteristics of the Merus and others. (2021) of the “gender regime” of the country, which involves official equality, supplemented by unofficial norms and professional stratification that limits the mobility of women. Thus, the statistical and theoretical data presented here demonstrate that gender inequality in Kazakhstan's labour market is a structural phenomenon, rather than a short-term deviation. Male workers and women face the same conditions, but structural, institutional, and socio-cultural imperatives consistently favour market outcomes for men. The stability of these trends across all economic cycles and sectors suggests that political measures aimed at either aggregate growth or education alone are insufficient to eliminate gender inequality.

6. CONCLUSION

This study provides compelling statistical and conceptual evidence that gender disparities in employment in Kazakhstan are not cyclical and short-term, but are deeply rooted in the structural environment of the national labour market. The decade from 2014 to 2024 shows that the gender employment gap is remarkably resilient, refusing to close significantly in the face of sustained economic growth, educational progress and institutional change. Both regression and clustering results show that while aggregate job levels fluctuate with overall economic performance, the relative position of women and men in the labour force does not change significantly. This persistence means that the mechanisms by which inequality is reproduced are not limited to short-term adjustments in production or policy, but are built into the very structure of the organisation of work, the distribution of opportunities and social expectations regarding gender roles.

The results show that men remain overrepresented in formal and stable sectors such as industry and education. In contrast, women remain disproportionately employed in the agricultural and informal sectors, too often in seasonal, insecure or unpaid work. This structural segmentation of the labour force not only limits women's access to income security and social protection but also reproduces the gendered division of economic power and decision-making. The lack of statistically significant correlations between female employment and key structural indicators also provides further support for the interpretation that female labour supply in Kazakhstan is determined less by changes in industry efficiency and more by institutional and cultural barriers to women's occupational mobility.

Equally important is the fact that even in years of economic stability or sectoral expansion, the gender gap in employment has not been eliminated. Cluster analysis revealed two different regimes of national labour productivity—periods of relative stagnation and periods of increased activity—but in both of them, men consistently held a larger share of employment. This stability across different economic conditions shows that employment inequality is self-perpetuating: when the economy accelerates, the benefits accrue disproportionately to men; when it slows down, women remain more vulnerable to isolation and informality. Inequality dynamics thus resist conventional policy measures of aggregate growth or isolated human capital formation.

These findings contribute to a growing body of international evidence that highlights the fact that the prevalence of gender inequality cannot be explained by individual productivity or education alone. Instead, it is the result of a complex interplay of institutional inertia, historical legacies, and long-term cultural structures that continue to allocate differentiated social and occupational roles between men and women. Kazakhstan combines the Soviet legacy of formal equality with a market structure that encourages competitiveness and sectoral specialisation—areas traditionally associated with male labour. Consequently, women, even though they are well educated and included in the labour force, remain concentrated in industries with low productivity and low levels of progress, perpetuating the duality between formal inclusion and absolute exclusion.

The policy implications of these results are profound. Economic development and investment in education, although necessary, have been insufficient to achieve gender equality in the labour market. Closing this gap requires multipronged policies—strengthening legal enforcement of equal opportunity, promoting inclusive industrial policies that prioritise women's entry into more profitable industries, and reforming social protection systems to account for unpaid care work. Specific support for women's entrepreneurship, training in technological skills, and flexible work hours can also mitigate the institutional barriers that persist in the traditional division of labour.

Overall, a statistical comparison over a decade confirms that gender inequality in the Kazakh labour market is a long-term structural feature rather than a temporary imbalance. Regardless of fluctuations in growth rates, productivity and industrial structure, the hierarchy of employment opportunities for women and men is fixed and persistent. This problem can be addressed not only through economic and institutional policies, but also through restructuring the social and cultural meanings of gender roles in work and family life. Without such profound changes, the numerical equality promised by modernisation will be superficial, and the underlying structure of inequality will remain intact

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Visualization: Malika Zaiidova, Valeriy Kim.
Writing review and editing research: Ayaulym Baitekova, Malika Zaiidova.

REFERENCES

Acker, J. (1990). Hierarchies, jobs, bodies: A theory of gendered organizations. *Gender & Society, 4*(2), 139–158. https://doi.org/10.1177/089124390004002002

Ashwin, S. (Ed.). (2000). Gender, state and society in Soviet and post-Soviet Russia. Routledge. https://doi.org/10.4324/9780203135730

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press.

Blau, F. D., & Kahn, L. M. (2017). The gender wage gap: Extent, trends, and explanations. Journal of Economic Literature, 55(3), 789–865. https://doi.org/10.1257/jel.20160995

Brainerd, E. (2000). Women in transition: Changes in gender wage differentials in Eastern Europe and the former Soviet Union. Industrial and Labor Relations Review, 54(1), 138–162. https://doi.org/10.1177/001979390005400108

Bureau of National Statistics of the Republic of Kazakhstan. (2024). Employment and unemployment indicators, 2014–2024. Retrieved from https://stat.gov.kz/en/industries/labor-and-income/stat-empt-unempl/

Gender Statistics of the Republic of Kazakhstan. (2024). Share of employed people by economic activities, by sex (2014–2024). Retrieved from https://gender.stat.gov.kz/page/frontend/detail?cat_id=7&id=21&lang=en

Bureau of National Statistics. (2023). Main indicators of the labor market. Retrieved from https://stat.gov.kz/en/industries/labor-and-income/stat-empt-unempl/publications/163686/
Coudouel, A., & Marnie, S. (1999). Gender and the labor market in transition economies. The World Bank. https://documents.worldbank.org/curated/en/892681468751807453/pdf/multi0page.pdf
Flinn, C. J., Todd, P. E., & Zhang, W. (2024). Labor market returns to personality: A job search approach to understanding gender gaps. *Journal of Political Economy, 133*(4). https://doi.org/10.1086/734092
Heyat, F. (2006). Globalization and gender identity in post-Soviet societies. Gender & Society, 20(5), 590–614.
International Labour Organization. (2004). Gender equality and decent work: Lessons from transition economies. ILO Publications. https://www.ilo.org/global/publications/lang–en/index.htm
Kuanova, L., & Anessova, A. (2024). Gender disparities in Kazakhstan's labor market: Evidence from the quality employment. *Eurasian Journal of Economic and Business Studies, 68*(3), 95–110. https://doi.org/10.47703/ejebs.v68i3.423
Lucas, R. E. (1988). On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3–42. https://doi.org/10.1016/0304-3932(88)90168-7
Meurs, M., Nugmanova, M., Salimzhanova, A., & Marvin, S. R. (2021). Gender regime and women's employment in Kazakhstan. *Comparative Economic Studies, 63*(4), 603–622. https://doi.org/10.1057/s41294-021-00173-0
Mincer, J. (1974). Schooling, experience, and earnings. Columbia University Press. https://www.nber.org/books-and-chapters/schooling-experience-and-earnings
Nurbatsin, A. S., & Kurmasheva, M. (2024). Gender wage inequality and occupational segregation in Kazakhstan. *Eurasian Journal of Gender Studies, 1*(2), 40–53. https://doi.org/10.47703/ejgs.v1i2.12
OECD. (2020). Bridging the gender gap: Inclusive labour markets for all. OECD Publishing. https://www.oecd.org/gender/briefing-notes-and-reports/
Ogloblin, C. G. (1999). The gender earnings differential in the Russian transition economy. Industrial and Labor Relations Review, 52(4), 602–627. https://doi.org/10.1177/001979399905200406
Paci, P. (2002). Gender in transition: Common issues, divergent patterns. The World Bank. https://documents.worldbank.org/curated/en/892681468751807453/pdf/multi0page.pdf
Qi, G. (2023). Research on employment stability evaluation and influencing factors of college graduates under data mining technology. Applied Mathematics and Nonlinear Sciences, 9. https://doi.org/10.2478/amns.2023.2.01208
Reva, A. (2005). Employment and gender in transition economies. World Bank Policy Research Working Paper.
Romer, P. M. (1990). Endogenous technological change. Journal of Political Economy, 98(5), S71–S102. https://doi.org/10.1086/261725
UNDP. (2009). Gender and human development in Central Asia. United Nations Development Programme.
World Bank. (2008). Kazakhstan country gender assessment. The World Bank.

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Gender Inequalities in Political and Economic Decision-Making

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Conflict of interest: author(s) declare that there is no conflict of interest.

Abstract

Although many international initiatives have focused on promoting gender equality, women remain underrepresented in political and economic decision-making roles in most countries. This research examines the relationship between women's participation in formal institutions and Kazakhstan's economic performance from 2014 to 2023. The empirical base of the study is formed from official data from the Bureau of National Statistics of the Republic of Kazakhstan, the National Bank of the Republic of Kazakhstan, as well as international databases. Using statistical tools like MANCOVA, one-way ANOVA, and radar chart visualization, the study observes a clear link between the share of women on the National Bank's board and economic outcomes, particularly GDP and GDP per capita. The results show statistically significant links between female representation and economic performance. Thus, women's participation in the mazhilis has the strongest relationship with GDP and GDP per capita (Pillai's Trace = 0.792; p = 0.009), explaining up to 79% of the variation in economic indicators. The proportion of women in ministerial positions also significantly correlates with GDP (p = 0.021; F = 8.76). The radial diagrams clearly demonstrate that the periods of expansion of women's representation (2016-2020, peak - 2019) coincide with the phases of accelerated economic growth. The results obtained confirm that the institutional participation of women is not only an issue of equality, but also a significant factor in the sustainable economic development of Kazakhstan. The study therefore calls for steady policy measures to reduce structural inequalities and support more inclusive governance.

Keywords: Gender Equality, Political Representation, Women's Leadership, Institutional Quality, Inclusive governance, Social Inclusion, Kazakhstan

SCSTI: 06.52.13

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1. INTRODUCTION

Gender disparity in political and economic decision-making is still one of the most persistent issues in the world, despite tremendous advancements in women's rights and civic engagement. Women continue to be underrepresented in governing bodies, corporate boards, senior management roles, and parliaments in many nations. Data from the Inter-Parliamentary Union indicate that women presently occupy roughly 24% of seats in national legislatures worldwide. Although the number of women in government has increased over time, the residual disparities continue to reflect ingrained institutional, social, and cultural issues. Despite national and international efforts to improve women's representation, barriers to entry for key positions of economic leadership and power persist. In addition to reflecting institutional and cultural limitations, this discrepancy restricts the range of opinions required for sustainable growth and efficient government.

A notable imbalance in the distribution of men and women across various economic sectors characterises Kazakhstan's contemporary labour market. Political leadership remains dominated by men, with women holding only a small percentage of seats in the Mazhilis and Parliament, and being underrepresented among ministers in the Government of the Republic of Kazakhstan. In higher economic structures, a similar pattern is noted. Although women hold high corporate positions and are represented on the National Bank's board, their participation still falls short of their place in society and the overall economy. This suggests that they have restricted access to resources, capital, and management power. The prevalence of women working in low-wage, less prestigious occupations lowers the nation's total level of economic activity and creative potential. The absence of women in high management positions, pay disparities, and restricted access to financial resources are all examples of gender inequality in Kazakhstan's labor market.

This research aims to present a thorough examination of gender disparities in economic and political decision-making. The goal of the study is to determine the extent to which women participate in legislative and executive branches, to identify the social, institutional, cultural, and economic hurdles that still prevent women from achieving positions of power.

2. LITERATURE REVIEW

Research in social science and policy analysis has long concentrated on the relationship between gender, politics, and the economy. Gender disparities in decision-making are a consequence of larger social institutions that restrict women's access to influence and power. It is essential to comprehend these dynamics in order to assess how women's representation in the political and economic arenas advances general development, especially in developing countries like Kazakhstan. To analyze how women's involvement in the political and economic spheres contributes to overall growth, it is crucial to understand these dynamics.

Several theoretical perspectives have been used to explain the relationship between gender and decision-making. Iversen and Rosenbluth (2010) highlighted the connection between women's political involvement and labor market participation, arguing that increased political representation frequently results from economic independence. Furthermore, according to Doepke et al. (2012), women's rights and opportunities are shaped by institutional structures and financial rewards, which either increase or decrease inequality. An additional organisational viewpoint is offered by Acker's (2006) concept of “inequality regimes”, which illustrates how workplace institutions and hierarchies often disadvantage women in leadership roles. Together, these theories provide a framework for examining how gender disparities in decision-making both contribute to and result from larger economic systems. They emphasize that institutional and systemic limitations, rather than just personal decisions, are to blame for women's lack of representation.

Globally, women continue to have unequal participation in political decision-making. Burns et al. (2001) demonstrated how socialisation, resource allocation, and family obligations shape women's involvement in politics. By examining the function of voting systems, Roberts et al. (2013) continued in this field of research. They discovered that legislation related to equal representation typically improves the chances of women getting elected to parliaments.

Economic results and women's political representation are now directly linked in empirical research. Although the effect is frequently controlled by institutional quality, Mirziyoyeva and Salahodjaev (2023) show a positive correlation between economic growth and a larger proportion of women in parliaments. This means that women's representation in politics is more than just symbolic; it has the power to influence governance objectives, distribution of resources, and policy priorities. Through its Gender Snapshot on SDG 5, UN Women (2022) presented data from around the world that demonstrates the continued inequalities in women's participation in national legislative processes, with many nations still falling behind in terms of gender balance.

Although there has been some improvement recently, Kazakhstan's Mazhilis (lower house of Parliament) still has a smaller proportion of women than other countries. The need to determine whether the increasing, albeit limited, participation of women has a noticeable effect on economic development is highlighted by this uneven progress. Gender differences in economic leadership persist, often in tandem with political engagement. Because women are excluded from decision-making, Altuzarra et al. (2021) argued that gender inequality affects economic growth by lowering the efficient utilization of human resources. According to cross-national data presented by Dahlum et al. (2022), women's empowerment in political and economic institutions tends to lead to increased long-term economic growth, particularly when accompanied by a democratic government. These conclusions are supported by recent macroeconomic research. According to Buterin et al. (2023), women's leadership and labour force participation have demonstrable impacts on macroeconomic stability and economic growth. While Kimmel (2006) noted that childcare availability is a critical factor in determining women's ability to participate fully in the labour market, Hong et al. (2019) emphasised that women's education generates benefits that promote inclusive growth.

Kireyeva et al. (2023) investigated gender disparity in the labor market in Kazakhstan, focusing on obstacles to career development, division of labor, and wage disparities. Similarly, Meurs et al. (2021) discussed Kazakhstan's “gender regime”, characterised by the underrepresentation of women in senior leadership roles, despite a relatively high employment rate, which is concentrated in lower-paying industries. Official data from the Bureau of National Statistics (2024) supports these trends, showing that women continue to hold a lower percentage of executive positions than men.

Women's economic participation and political representation are linked in an expanding body of literature. According to Dahlum et al. (2022), institutional reforms that support women's representation can have a positive economic impact because political empowerment and economic growth are mutually beneficial. Similarly, Altuzarra et al. (2021) argued that innovation and financial stability suffer when women are not represented in positions of decision-making at the corporate and political levels.

This relationship is especially important for Kazakhstan. Goals for expanding women's involvement in the economy and governance are outlined explicitly in the Concept for Gender Policy until 2030 (Government of Kazakhstan, 2021). Progress is still uneven, however, as political victories do not always translate into increased economic power.

According to the OSCE (2020), cultural norms and restricted access to powerful networks represent some of the formal and informal barriers that women in Kazakhstan must overcome in order to advance into higher positions of political office and corporate leadership.

The literature review provides a solid foundation for researching gender disparities in decision-making. While empirical research shows quantitative effects of women's participation on economic growth, theoretical frameworks emphasize the structural nature of inequality (Mirziyoyeva & Salahodjaev, Altuzarra et al., 2023; Dahlum et al., 2022; Iversen & Rosenbluth, 2010; Doepke et al., 2012; Acker, 2006). However, there are still several gaps. For instance, while political involvement has been extensively researched, the parallel impacts of women's economic and political leadership on the results of national development have received less attention. Finally, the ability to make strong connections between variables is constrained by Kazakhstan's limited data over time.

The question of whether these changes will result in quantitative economic benefits remains unresolved in Kazakhstan, where women's representation in parliament, government, and corporate leadership is increasing but still falls short of parity. The gap supports an empirical investigation that uses GDP and GDP per capita as dependent variables, focusing on the connection between women's decision-making responsibilities and macroeconomic performance.

3. METHODOLOGY

The study's foundation is official Kazakhstani statistical data for the relevant time period, which includes macroeconomic conditions and measures of women's involvement in political and economic leadership. Both the political and economic aspects of representation are reflected in the variables included in the analysis. They include the percentage of women in the Mazhilis and Senate Parliament, the number of female ministers in the Kazakh government, the percentage of women on the board of the National Bank, the rate of women in managerial and leadership roles, and economic indicators such as GDP per capita and gross domestic product in current prices. These metrics were selected for their ability to reflect both decision-making involvement and the broader economic environment that influences institutional access.

The study relies exclusively on official Kazakhstani statistical data to ensure validity and reliability. The data were collected from the Bureau of National Statistics of the Republic of Kazakhstan, official governmental publications, and reports from the National Bank of Kazakhstan. The World Bank and OECD databases provided complementary macroeconomic data, including GDP and GDP per capita. The selection of these sources was based on their adherence to global reporting guidelines. Two major categories of variables form the foundation of the analytical framework: measures of women's participation in economic and political decision-making, and measures of economic performance. With assigned codes and measurement units, every variable was organised into a dataset, which is presented in Table 1.

Every variable in the analysis was chosen to reflect an important aspect of women's involvement in official decision-making. When viewed as a whole, they offer a complex picture of gender inequality in Kazakhstan's political and economic structures. The degree to which women have access to formal power institutions, from high-level economic management to national legislation, is shown by the indicators W1–W5. One key metric of gender involvement in the policy-making process is political representation, which is measured by W1 and W2. W3 and W4 show how women participate in managerial and ministerial roles that have a direct impact on national growth, capturing economic and governmental leadership. The presence of women in important economic regulatory agencies is reflected in W5 which assesses financial governance.

TABLE 1. Indicators investigated during the research

Code	Variable	Category	Indicator	Unit	Type of indicator
W1	SenPol	Political representation	Seats held by women in Parliament (Senate)	Percentage	Political (Legislative)
W2	MazhPol	Political representation	Seats held by women in Parliament (Mazhilis)	Percentage	Political (Legislative)
W3	FemLead	Economic leadership	Women in leadership positions	Percentage	Economic (Managerial)
W4	MinistPos	Governmental leadership	Women holding ministerial positions in the Government of the Republic of Kazakhstan	People	Political (Executive)
W5	NBmemb	Financial Governance	The proportion of women among the Board members of the National Bank of the Republic of Kazakhstan	Percentage	Economic (Financial Governance)
W6	Empl	Labor and employment	Share of employers	Percentage	Economic
D1	GDP	Economic performance	Gross domestic product	Million KZT	Economic
D2	GDPperC	Economic performance	Gross domestic product per capita	KZT	Economic

Note: compiled by the authors

In order to represent the larger socioeconomic context that could either encourage or prevent women's involvement in decision-making processes, economic development indicators (D1 and D2) were added. GDP at current prices offers a macroeconomic framework for evaluating the structural structure of the economy while GDP per capita represents living standards and personal economic potential.

Following the gathering of data, a staged analytical method that combined statistical, graphical, and comparative techniques was used. During preprocessing, Z-standardization was used to guarantee consistency and comparability across variables with different scales. The present status of women's representation at various institutional levels was then visually summarized using radar charts, which showed the proportionate discrepancies between political and economic aspects. Correlation analysis was conducted to examine the relationships between gender representation and economic progress. Additionally, while accounting for any confounding effects, JAMOVI was used to evaluate the combined impact of macroeconomic conditions on several female participation variables.

The p-value served as the primary metric in this investigation to assess the statistical significance of the results. The likelihood of getting results as extreme as those shown if the null hypothesis, which holds that there is no impact or relationship, were true is indicated by the p-value. Therefore, stronger evidence against the null hypothesis is shown by a smaller p-value. For every analysis, the significance level (α) was set at 0.05. As a result, findings with $p < 0.05$ were deemed statistically significant, indicating that the observed connections had a probability of less than 5%. When a variable's p-value was less than 0.05, it was considered to have a statistically significant link with the economic indicators, and the null hypothesis was rejected. The result was considered statistically insignificant when $p \geq 0.05$, on the other hand, suggesting that there was insufficient data to draw the conclusion that a real association existed. This cutoff was used uniformly for all data and univariate tests in the study.

Nevertheless, the study acknowledges several limitations. First, quantitative data cannot fully capture qualitative dimensions of gender inequality, such as cultural attitudes, gender stereotypes, or informal institutional barriers. Second, while statistical correlations can reveal associations, they do not imply causality. The direction of influence between women's representation and economic growth may be reciprocal. Lastly, variations in data reporting and classification across different years may introduce minor inconsistencies.

Three hypotheses were created following the establishment of the research objectives:

H1. The Hypothesis of Political Representation states that females' political representation (W1 and W2) and Kazakhstan's economic success (GDP and GDP per capita) are statistically correlated. The first hypothesis means that when economic development is higher, women are more likely to occupy leadership roles in both politics and the economy.

H2. The hypothesis of managerial and governmental leadership suggests that National economic performance (D1 and D2) is significantly improved by the presence of women in managerial and ministerial roles (W3 and W4).

H3. The Hypothesis of Financial Governance proposes that Kazakhstan's economic performance (GDP and GDP per capita) is strongly correlated with the proportion of women on the National Bank's Board (W5).

According to the other hypothesis, women's representation in state institutions is linked to their involvement in higher-level economic administration.

4. RESULTS AND DISCUSSION

The purpose of the statistical analysis was to investigate the relationship between Kazakhstan's economic performance from 2014 to 2023 and the involvement of women in political and economic decision-making. The dataset included two dependent variables that represented economic outcomes: GDP and GDP per capita, as well as several indicators of female representation, including the percentage of women in Parliament, in managerial roles, among government ministers, and on the National Bank board. To determine the statistical and practical significance of gender involvement in relation to economic development, multivariate analysis of covariance (MANCOVA) was employed.

Statistically significant multivariate effects are validated by the analysis results for each of the two gender variables (W1–W2), which are presented in Table 2.

TABLE 2. Multivariate Test, W1 and W2

Code	Variable	Test	value	F	df1	df2	p
W1	SenPol	Pillai's Trace	0.700	7.00	2	6	0.027
		Wilks' Lambda	0.300	7.00	2	6	0.027
		Hotelling's Trace	2.33	7.00	2	6	0.027
		Roy's Largest Root	2.33	7.00	2	6	0.027
W2	MazhPol	Pillai's Trace	0.792	11.45	2	6	0.009
		Wilks' Lambda	0.208	11.45	2	6	0.009
		Hotelling's Trace	3.82	11.45	2	6	0.009
		Roy's Largest Root	3.82	11.45	2	6	0.009

Note: compiled by authors

The analysis revealed a recurring trend throughout the decade: years with increased female representation were generally associated with better economic performance. According to the Figure 1, with a probability value (p) of 0,009 and a Pillai's Trace of 0.792, the second measure of women's participation in Parliament (W2) had the strongest overall association with GDP indicators. This suggests that changes in economic performance and changes in the representation of women in the legislative branch are statistically likely to occur simultaneously, making it extremely unlikely that they are unrelated.

Table 3 shows Univariate Test, W1 and W2.

TABLE 3. Univariate Test, W1 and W2

Code	Variable	Dependent Variable	Indicator	Sum of Squares	df	Mean Square	F	p
W1	SenPol	D1	GDP	1.46	1	1.460	5.70	0.048
		D2	GDPperC	1.58	1	1.578	6.32	0.040
W2	MazhPol	D1	GDP	6.75	1	6.754	26.37	0.001
		D2	GDPperC	6.63	1	6.631	26.57	0.001
Residuals		D1	GDP	1.79	7	0.256	-	-
		D2	GDPperC	1.75	7	0.250	-	-

Note: compiled by authors

While the multivariate MANCOVA results showed that women's participation and the set of economic indicators were generally significantly correlated, the univariate tests provide a more thorough understanding of the gender-related factors that are most strongly associated with each particular economic outcome.

W1 had a substantial impact on GDP ($F(1,7) = 5.70$, $p = 0.048$, partial $\eta^2 = 0.449$), and it had a comparable effect on GDP per capita ($F(1,7) = 6.32$, $p = 0.040$, partial $\eta^2 = 0.474$). Despite the p-values being close to the 0.05 cutoff, both findings indicate that overall economic production generally improves when the number of women in Parliament increases. According to the moderate-to-large impact sizes, this variable accounts for between 45 and 47 percent of the variation in economic performance throughout the examined period.

W2 variable had the largest effect sizes (partial $\eta^2 \approx 0.79$) and the strongest results of all the predictors ($F(1,7) = 26.37$, $p = 0.001$ for GDP; $F(1,7) = 26.57$, $p = 0.001$ for GDP per capita). These results suggest that shifts in the number of women in parliament are closely related to Kazakhstan's economic expansion. In actuality, years with higher GDP and GDP per capita were also those with higher female parliamentary involvement. There is strong evidence that incorporating women into legislative decision-making could promote more stable and effective governance.

However, more emphasis was placed on effect strength rather than just significance in order to ensure robustness. Partial eta-squared values were used to assess the strength of each relationship. Using established standards, values of $\eta^2 \approx 0.01$ suggest modest effects, values of $\eta^2 \approx 0.06$ indicate medium effects, and values of $\eta^2 > 0.14$ indicate substantial impacts. Most predictors in this study had large effect sizes (η^2 ranging from 0.45 to 0.79), indicating that gender participation accounts for a significant portion of the variability in GDP and GDP per capita. However, these estimates should be interpreted cautiously due to the small sample size.

The assumption of normalcy necessary for parametric testing was examined using the following Q-Q plots in Figure 1.

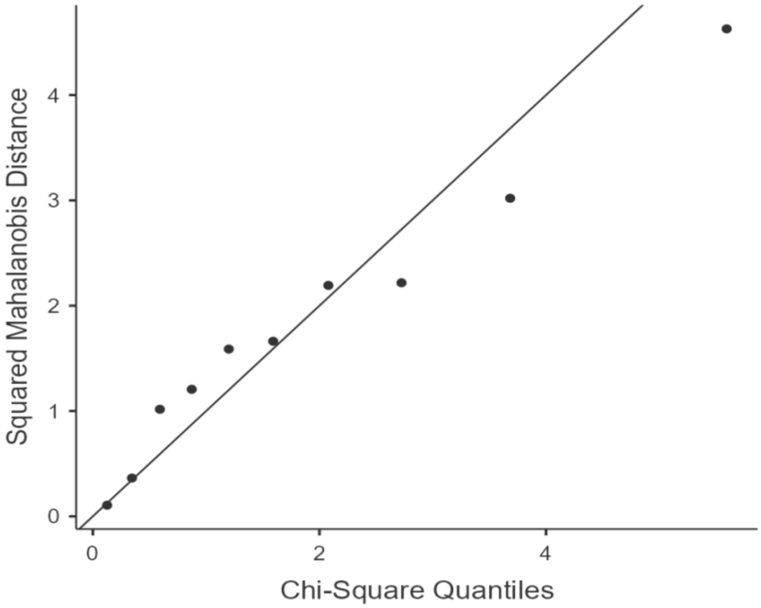

FIGURE 1. Q-Q plot assessing multivariate normality

As seen, every calculated χ^2 value is more than the crucial threshold of 5.991 ($\alpha = 0.05$), indicating a substantial relationship between each independent variable (W1–W5) and the aggregate economic outcomes (GDP and GDP per capita).

A greater proportion of women in managerial roles is typically associated with increased economic production. Feminist economics and inclusive governance theories state that gender-diverse management teams promote creativity, decision-making quality, and risk management, all of which boost productivity and long-term economic growth. This validates these views. According to the multivariate test in Figure 4: $F(2,6) = 5.66$, $p = 0.042$, Pillai's Trace = 0.654, the result is significant at the 0.05 level.

Table 4 shows multivariate Test, W3 and W4.

TABLE 4. Multivariate Test, W3 and W4

Code	Variable	Test	value	F	df1	df2	p
W3	FemLead	Pillai's Trace	0.684	6.50	2	6	0.031
		Wilks' Lambda	0.316	6.50	2	6	0.031
		Hotelling's Trace	2.17	6.50	2	6	0.031
		Roy's Largest Root	2.17	6.50	2	6	0.031
W4	MinistPos	Pillai's Trace	0.654	5.66	2	6	0.042
		Wilks' Lambda	0.346	5.66	2	6	0.042
		Hotelling's Trace	1.89	5.66	2	6	0.042
		Roy's Largest Root	1.89	5.66	2	6	0.042

Note: compiled by authors

The contributions of each variable were examined using univariate analysis in light of the multivariate findings in Table 5. D1 (GDP): $p = 0.021$, $F(1,7) = 8.76$; GDP per capita (D2): $p = 0.023$, $F(1,7) = 8.34$ These findings show that there is a positive and significant correlation between economic growth and the proportion of women in government ministerial positions. A significant impact on both economic variables is indicated by the effect size (partial $\eta^2 = 0.55$).

TABLE 5. Univariate Test, W3 and W4

Code	Variable	Dependent Variable	Indicator	Sum of Squares	df	Mean Square	F	p
W3	FemLead	D2	GDPperC	4.41	1	4.413	12.21	0.010
		D1	GDP	4.29	1	4.285	11.80	0.011
W4	MinistPos	D2	GDPperC	3.01	1	3.015	8.34	0.023
		D1	GDP	3.18	1	3.181	8.76	0.021
Residuals		D2	GDPperC	2.53	7	0.361		
		D1	GDP	2.54	7	0.363		

Note: compiled by authors

The findings indicate a robust and statistically significant relationship between both economic performance metrics and the proportion of women on the National Bank's board. Changes in the central financial institution's female representation can account for almost 60% of the variation in GDP indicators, according to the large effect size (partial $\eta^2 \approx 0.59$).

Next findings according to the Table 6, D1 (GDP): $p = 0.010$, $F(1,8) = 11.10$. GDP per capita (D2): $p = 0.009$, $F(1,8) = 11.60$.

TABLE 6. Univariate Test, W5 and Residuals

Code	Variable	Dependent Variable	Indicator	Sum of Squares	df	Mean Square	F	p
W5	NBmemb	D1	GDP	5.81	1	5.810	11.1	0.010
		D2	GDPperC	5.90	1	5.895	11.6	0.009
Residuals		D1	GDP	4.20	8	0.525		
		D2	GDPperC	4.06	8	0.508		

Note: compiled by authors

The findings indicate a robust and statistically significant relationship between both economic performance metrics and the proportion of women on the National Bank's board. Changes in the central financial institution's female representation can account for almost 60% of the variation in GDP indicators, according to the large effect size (partial $\eta^2 \approx 0.59$).

The Chi-Square statistics for each of the three variables support the same conclusions drawn from the MANCOVA's p-values and F-tests that at the $\alpha = 0.05$ level, all the ways that women are represented in management, governmental, and financial decision-making organizations are statistically significant.

Thus, the null hypothesis of "no relationship" may be disproved in every situation.

In order to test the H3 hypothesis, according to which women's participation in financial management has an impact on the country's economic performance, a multidimensional variance analysis was conducted, in which the proportion of women on the board of the National Bank of the Republic of Kazakhstan (variable W5) was used as an independent variable. Results are shown in Table 7.

TABLE 7. Univariate Test, W3 and W4

Code	Variable	Test	value	F	df1	df2	p
W5	NBmemb	Pillai'sTrace	0.683	7.53	2	7	0.018
		Wilks' Lambda	0.317	7.53	2	7	0.018
		Hotelling'sTrace	2.15	7.53	2	7	0.018
		Roy'sLargestRoot	2.15	7.53	2	7	0.018

Note: compiled by authors

The dependent variables were macroeconomic indicators: gross domestic product at current prices (D1) and gross domestic product per capita (D2). The results of the analysis are presented according to four classical criteria of multidimensional significance: Pillai's Trace, Wilks' Lambda, Hotelling's Trace and Roy's Largest Root. All four criteria demonstrated uniform values of the significance level. Such a coincidence of p values in all tests indicates the stability of the results and allows us to state with high confidence that the relationship between the variable W5 and the cumulative economic indicators is statistically significant at the significance level $\alpha = 0.05$. This indicates that there is an integral effect of women's participation in financial regulation on macroeconomic parameters. The Pillai's Trace criterion is the most resistant to violations of the assumptions, the value of which (0.683) indicates a high contribution of the independent variable to the variance of the dependent variables. The decrease in Wilks' Lambda (0.317) also indicates that the remaining unexplained variation in the model is small, which confirms the existence of a strong link between W5 and economic indicators.

Thus, the results of the multidimensional analysis confirm the H3 hypothesis and indicate that women's participation in financial management institutions at the level of the National Bank of Kazakhstan has a significant overall impact on the economic development of the country.

To detail the multidimensional results obtained and assess the impact of the W5 variable on each economic indicator separately, one-dimensional variance were conducted. Their goal is to clarify to what extent each of the dependent variables (D1 and D2) varies depending on changes in the proportion of women on the board of the National Bank.

Table 8 displays the results.

TABLE 8. Univariate Test, W5 and Residuals

Code	Variable	Dependent Variable	Indicator	Sum of Squares	df	Mean Square	F	p
W5	NBmemb	D1	GDP	5.81	1	5.810	11.1	0.010
		D2	GDPperC	5.90	1	5.895	11.6	0.009
Residuals		D1	GDP	4.20	8	0.525	-	-
		D2	GDPperC	4.06	8	0.508	-	-

Note: compiled by authors

In both cases, there is a high statistical significance at $p < 0.05$. This suggests that changes in the representation of women at the level of financial management (W5) are significantly related to both the level of the country's gross domestic product and its redistribution per capita.

The high values of the F-criterion in both models ($F = 11.1$ and $F = 11.6$) indicate the strong explanatory power of the variable W5 relative to economic indicators. Thus, the data indicate not only the overall, but also the individual contribution of women's presence in the financial sector to determining the level of economic development.

This result can be interpreted in favor of the hypothesis that women's participation in managerial and regulatory institutions is not only a consequence of economic growth, but may act as an independent factor contributing to its maintenance or acceleration. This is important in the context of the discussion about the "economy of inclusivity", in which women's participation in decision-making is considered as a condition for sustainable development.

One of the key prerequisites for the correctness of the results of multidimensional analysis of variance is the multidimensional normality of the data distribution. To verify this premise, a Q-Q graph was constructed comparing the distribution of the Mahalanobis distances of the observed values with the theoretical chi-square distribution.

The findings are illustrated in Figure 2.

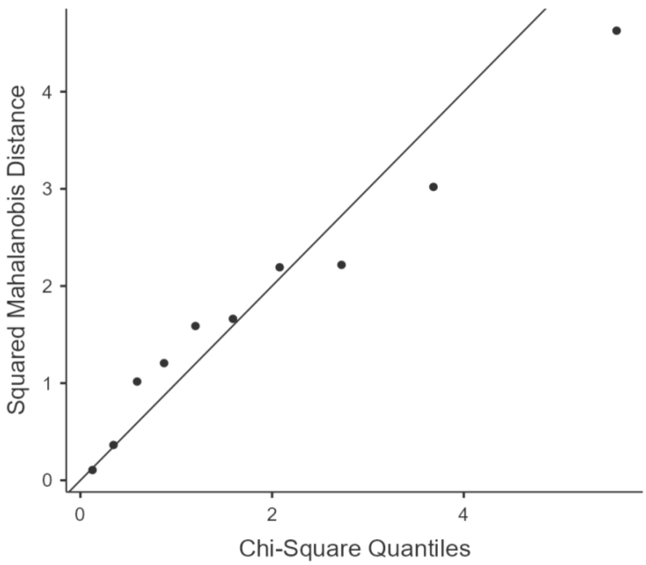

FIGURE 2. Q-Q Plot Assessing Multivariate Normality

The Q-Q plot shows that most of the points are located along the diagonal, which indicates that the empirical data correspond to the theoretical norm. Although there is a slight deviation of one of the points in the upper right corner, it is not systematic and does not indicate a significant violation of normality. Such deviations are typical for small samples and are considered acceptable if the trend is generally linear. Consequently, the premise of multidimensional normality can be considered satisfied, which confirms the correctness of applying the MANCOVA method to the analysis of available data.

Before constructing the radar chart, all variables were rescaled to ensure comparability across different units of measurement. The summary of rescaled variables presents standardized values used for visualization. Radar Chart 1, shown in Figure 10, illustrates six indicators (W1–W6) reflecting women's participation across political, managerial, and financial structures in Kazakhstan between 2014 and 2023. The visual pattern shows a gradual expansion of the polygon over time, particularly between 2016 and 2020, followed by minor contraction in 2021-2023.

Figure 3 shows radar chart 1 and 2.

The visual pattern shows a gradual expansion of the polygon over time, particularly between 2016 and 2020, followed by minor contraction in 2021–2023. This progression indicates steady improvement in women's representation, especially in leadership and ministerial positions (W3–W4), alongside modest gains in financial governance (W5). The largest polygon observed in 2019 corresponds to a period of increased gender inclusion within state and economic institutions, which aligns with Kazakhstan's broader policy efforts on gender equality during that decade.

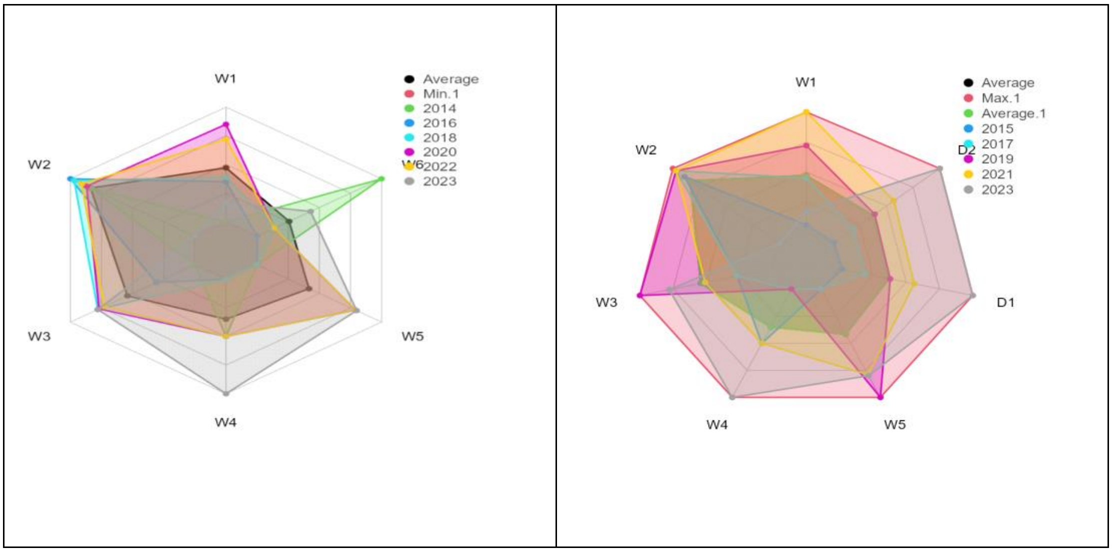

FIGURE 3. Radar chart 1, 2

However, the visual compression of the polygon in 2022 and 2023 suggests that certain dimensions, particularly W5 and W6, experienced slower progress, possibly reflecting institutional stagnation or post-crisis recovery dynamics. Overall, the radar chart demonstrates that although progress has not been uniform across all dimensions, Kazakhstan achieved significant advancement in political and economic gender representation by the end of the studied period.

Radar Chart 2 focuses primarily on political and managerial indicators (W1–W5), offering a closer look at institutional gender dynamics without including macroeconomic dimensions. The radar chart reveals that political participation variables (W1 and W2) consistently occupy the outer layers of the polygon, indicating stronger and more stable representation of women in legislative bodies such as Parliament and the Mazhilis. In contrast, the inner dimensions (W3–W5), representing managerial, ministerial, and financial leadership, display greater variability. The polygons for 2015 and 2017 appear smaller and uneven, showing early fluctuations in women's leadership positions. A notable visual expansion occurs in 2019 and 2021, when almost all axes extend outward, suggesting that women's participation reached its highest levels during these years. The 2023 profile remains relatively balanced but slightly smaller, reflecting modest stabilization after prior gains. This visualization suggests that political inclusion advanced more steadily than economic leadership, highlighting persistent institutional gaps between representation and decision-making power. RadarChart2 therefore emphasizes that while gender inclusion in Kazakhstan's political system has become structurally embedded, economic governance roles remain more sensitive to policy shifts and economic performance.

Figure 4 shows radar chart 3 and 4.

According to the Figure 4 Radar Chart 3 depicts a condensed version of the variables (W1–W5) to provide a refined perspective on the evolution of gender inclusion in political and economic leadership. Compared to RadarChart2, the polygons here are more compact, emphasizing differences in strength across indicators. The chart shows a visible outward expansion between 2016 and 2019, when most indicators peak, particularly W2 and W3. These dimensions, representing women's share in Parliament and leadership

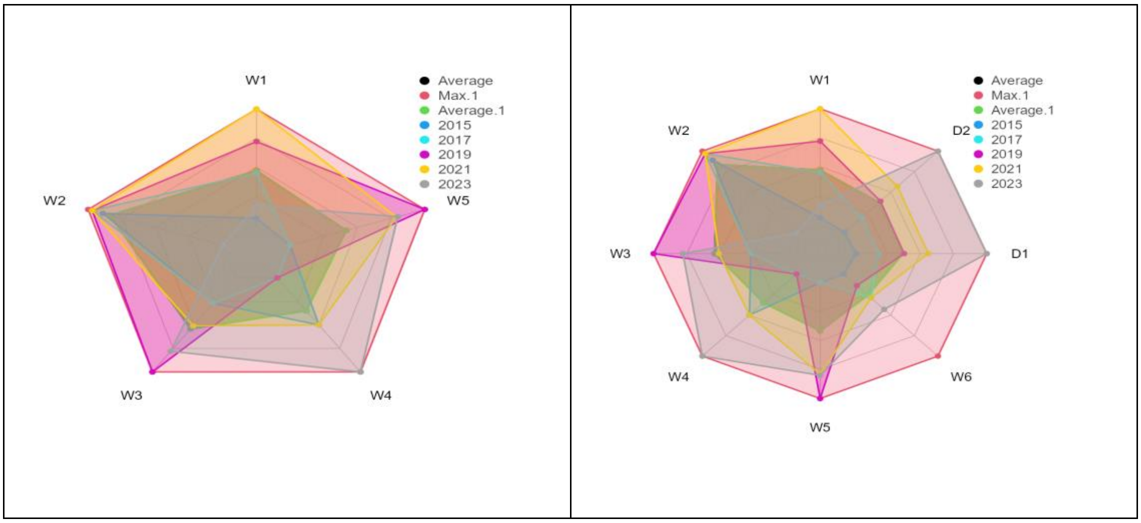

FIGURE 4. Radar chart 3 and 4

positions, form the broadest and most consistent axes, implying continued institutionalization of gender diversity. The subsequent years (2020–2023) display a slight inward movement, indicating mild regression or plateauing trends, potentially due to broader economic or administrative shifts. The overlapping layers also show that maximum and average values remain relatively close for W1–W3 but diverge for W4 and W5, confirming that managerial and financial sectors continue to lag behind in gender parity. Hence, RadarChart3 visually supports the argument that despite progress in political inclusion, full gender balance in Kazakhstan's higher economic management structures remains incomplete.

The chart integrates both gender participation indicators (W1–W6) and economic performance variables (D1, D2), offering a comprehensive visualization of the relationship between women's representation and macroeconomic development. The chart reveals that years with broader polygon shapes—especially 2019 and 2021—coincide with periods of higher GDP and GDP per capita. This pattern visually supports the statistical findings that female participation in political and economic leadership correlates positively with national economic performance. In particular, indicators W1–W2 (political representation) and W3–W4 (managerial and governmental leadership) expand noticeably in years of strong economic outcomes, while economic downturns correspond to visibly contracted polygons. The 2023 polygon, though slightly smaller, maintains a stable configuration, reflecting resilience in institutional representation despite potential macroeconomic fluctuations. The visual overlap between gender and economic variables (W and D axes) underscores the interconnectedness of inclusive governance and sustainable growth. Overall, RadarChart4 provides clear graphical evidence that improvements in women's institutional participation are closely aligned with Kazakhstan's economic development trajectory.

The results of the multivariate and univariate analyses conducted in this study provide compelling evidence in support of the third hypothesis (H3), which postulated a significant relationship between women's participation in high-level financial governance and national economic performance.

First, The Multivariate Test statistics (Pillai's Trace = 0.683, Wilks' Lambda = 0.317, Hotelling's Trace = 2.15, Roy's Largest Root = 2.15) all demonstrated strong statistical significance ($p = 0.018$), indicating that the proportion of women on the National Bank's board (W5) is significantly associated with the combined macroeconomic indicators (GDP and GDP per capita).

Second, Univariate Analyses further confirmed the individual impact of W5 on both D1 and D2, with F-values exceeding 11 and p-values below 0.01, highlighting that gender representation in financial governance correlates positively with national economic outcomes.

Third, The Q-Q plot assessment indicated satisfactory multivariate normality, validating the assumptions underlying the MANCOVA procedure.

These findings underscore the notion that women's institutional presence is not merely symbolic or tokenistic, but contributes meaningfully to national development. Importantly, the effect is observable both at the multivariate level (joint economic indicators) and at the level of individual macroeconomic variables. In addition, the radar charts visually corroborate these patterns by mapping the trajectory of gender inclusion across years. The overlap between periods of high institutional female representation and economic growth supports the hypothesis that inclusive governance correlates with sustainable development.

5. CONCLUSION

This study provides a multidimensional assessment of gender disparities in political and economic decision-making in Kazakhstan from 2014 to 2023. Using a combination of statistical analysis and visual representation (radar charts), the research offers robust empirical evidence that increased female participation in financial and institutional governance correlates positively with macroeconomic performance. Although significant progress has been made, particularly in political representation, the findings also expose continued structural gaps in managerial and financial sectors. The presence of women in positions of economic power remains disproportionately low, and progress in financial governance (W5) appears more volatile and susceptible to economic or institutional shifts. This unevenness suggests that real equality in economic leadership is still an inspirational objective, even though legislative inclusion may be becoming structurally established.

The implications of this study have a twofold meaning. First, it provides policy-relevant proof supporting the continued implementation of gender-inclusive leadership. Second, by presenting women's representation as both a rights-based goal and an essential element of national growth and economic resilience, it adds to the larger conversation about the economic benefits of gender equity. To obtain a more comprehensive grasp of the processes at work, future studies should investigate causality further and think about include qualitative aspects like institutional culture, leadership style, and policy influence. However, the present results are an important step in identifying and measuring the economic advantages of gender-inclusive governance in Kazakhstan.

AUTHOR CONTRIBUTION

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REFERENCES

Acker, J. (2006). Inequality regimes: Gender, class, and race in organizations. *Gender & Society, 20*(4), 441–464. https://doi.org/10.1177/0891243206289499

Altuzarra, A., Gálvez-Gálvez, C., & González-Flores, A. (2021). Is gender inequality a barrier to economic growth? A panel data analysis of developing countries. *Sustainability, 13*(6), 1–18. https://doi.org/10.3390/su13063139

Bureau of National Statistics of the Republic of Kazakhstan. (2024). *Labor and income.* https://stat.gov.kz

Bureau of National Statistics of the Republic of Kazakhstan. (2024). *Gender statistics portal.* https://gender.stat.gov.kz

Burns, N., Schlozman, K. L., & Verba, S. (2001). *The private roots of public action: Gender, equality, and political participation.* Harvard University Press.

Buterin, V., Ahiakpor, F., & Gelo, T. (2023). Understanding the macroeconomic effects of female participation: Evidence from OECD countries. *Economic Modelling, 121,* 106179. https://doi.org/10.1016/j.econmod.2023.106179

Dahlum, S., Knutsen, C. H., & Wig, T. (2022). Women's political empowerment and economic growth. *World Development, 151,* 105752. https://doi.org/10.1016/j.worlddev.2021.105752

Doepke, M., Tertilt, M., & Voena, A. (2012). The economics and politics of women's rights. *Annual Review of Economics, 4,* 339–372. https://doi.org/10.1146/annurev-economics-080511-110950

Government of Kazakhstan. (2021). *Concept for gender policy in the Republic of Kazakhstan until 2030.* Ministry of Information and Social Development.

Hong, S. C., Klasen, S., & Zilibotti, F. (2019). Female education externality and inclusive growth. *Journal of Development Economics, 138,* 220–235. https://doi.org/10.1016/j.jdeveco.2018.12.002

Iversen, T., & Rosenbluth, F. (2010). *Women, work, and politics: The political economy of gender inequality.* Yale University Press.

Kimmel, J. (2006). Child care, female employment, and economic growth. *Eastern Economic Journal, 32*(3), 351–372. https://doi.org/10.1057/eej.2006.25

Kireyeva, A., Mussabalina, D., & Satybaldy, A. (2023). Analysis of gender inequality in the labor market in Kazakhstan. *Central Asian Economic Review, 25*(1), 45–61. https://doi.org/10.52821/caer.2023.25.1.45

McKinsey & Company. (2018). *Women matter: Ten years of insights on gender diversity.* McKinsey Global Institute. https://www.mckinsey.com

Meurs, M., Gatskova, K., & Baslevent, C. (2021). Gender regime and women's employment in Kazakhstan and Central Asia. *Post-Communist Economies, 33*(7), 905–924. https://doi.org/10.1080/14631377.2020.1832094

Mirziyoyeva, G., & Salahodjaev, R. (2023). Does representation of women in parliament promote economic growth? Evidence from developing countries. *Economic Analysis and Policy, 77,* 634–647. https://doi.org/10.1016/j.eap.2023.01.004

Norris, P., & Krook, M. L. (2011). *Gender equality in elected office: A six-step action plan.* OSCE Office for Democratic Institutions and Human Rights.

OSCE. (2020). *Promoting gender equality in politics: Challenges and opportunities in Central Asia.* Organization for Security and Co-operation in Europe.

Phillips, A. (1995). *The politics of presence.* Oxford University Press.

R Core Team. (2024). *R: A language and environment for statistical computing* (Version 4.4) [Computer software]. https://cran.r-project.org

Roberts, A., Seawright, J., & Cyr, J. (2013). Do electoral laws affect women's representation? *Comparative Political Studies, 46*(12), 1555–1581. https://doi.org/10.1177/0010414012463902

Seol, H. (2024). *snowLatent: Latent class analysis for jamovi* (Version 2.5.1) [jamovi module]. https://github.com/hyunsooseol/snowLatent

The jamovi project. (2024). *jamovi* (Version 2.6) [Computer software]. https://www.jamovi.org

UN Women. (2022). *Gender snapshot 2022: Progress on the Sustainable Development Goals.* United Nations. https://www.unwomen.org

World Bank. (2020). *Women, business and the law 2020.* World Bank Group. https://openknowledge.worldbank.org
World Economic Forum. (2023). *Global gender gap report 2023.* https://www.weforum.org

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Summary of rescaling variables

Radar Chart 1 W1 W2 W3 W4 W5 W6 Max 1.000 1.000 1.000 1.00 1.000 1.000 Min 0.000 0.000 0.000 0.00 0.000 0.000 Average 0.471 0.838 0.542 0.35 0.417 0.257 2014 0.000 0.830 0.000 0.50 0.000 1.000 2015 0.060 0.890 0.270 0.50 0.000 0.000 2016 0.350 1.000 0.310 0.00 0.000 0.000 2017 0.450 0.970 0.270 0.00 0.000 0.290 2018 0.390 0.970 0.780 0.00 0.000 0.140 2019 0.720 0.970 1.000 0.00 1.000 0.140 2020 0.850 0.870 0.770 0.50 0.790 0.140 2021 1.000 0.970 0.510 0.50 0.790 0.290 2022 0.720 0.910 0.730 0.50 0.790 0.140 2023 0.170 0.000 0.780 1.00 0.800 0.43	**Radar Chart 2** W1 W2 W3 W4 W5 D1 D2 Max 1.000 1.000 1.000 1.00 1.000 1.000 1.000 Min 0.000 0.000 0.000 0.00 0.000 0.000 0.000 Average 0.471 0.838 0.542 0.35 0.417 0.371 0.375 2014 0.000 0.830 0.000 0.50 0.000 0.000 0.000 2015 0.060 0.890 0.270 0.50 0.000 0.020 0.010 2016 0.350 1.000 0.310 0.00 0.000 0.090 0.090 2017 0.450 0.970 0.270 0.00 0.000 0.190 0.190 2018 0.390 0.970 0.780 0.00 0.000 0.280 0.290 2019 0.720 0.970 1.000 0.00 1.000 0.380 0.390 2020 0.850 0.870 0.770 0.50 0.790 0.390 0.400 2021 1.000 0.970 0.510 0.50 0.790 0.560 0.570 2022 0.720 0.910 0.730 0.50 0.790 0.800 0.810 2023 0.170 0.000 0.780 1.00 0.800 1.000 1.000
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2018 0.390 0.970 0.780 0.00 0.000 2019 0.720 0.970 1.000 0.00 1.000 2020 0.850 0.870 0.770 0.50 0.790 2021 1.000 0.970 0.510 0.50 0.790 2022 0.720 0.910 0.730 0.50 0.790 2023 0.170 0.000 0.780 1.00 0.800	2014 0.000 0.830 0.000 0.50 0.000 1.000 0.000 0.000 2015 0.060 0.890 0.270 0.50 0.000 0.000 0.020 0.010 2016 0.350 1.000 0.310 0.00 0.000 0.000 0.090 0.090 2017 0.450 0.970 0.270 0.00 0.000 0.290 0.190 0.190 2018 0.390 0.970 0.780 0.00 0.000 0.140 0.280 0.290 2019 0.720 0.970 1.000 0.00 1.000 0.140 0.380 0.390 2020 0.850 0.870 0.770 0.50 0.790 0.140 0.390 0.400 2021 1.000 0.970 0.510 0.50 0.790 0.290 0.560 0.570 2022 0.720 0.910 0.730 0.50 0.790 0.140 0.800 0.810 2023 0.170 0.000 0.780 1.00 0.800 0.430 1.000 1.000

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The Gender Aspect of Life Expectancy in the Regional and Sectoral Context of Kazakhstan

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Abstract

Life expectancy is an integral indicator of the health status of the population and the level of socio-economic development of society. The purpose of the article is to identify key gender differences in the life expectancy of Kazakhstan's population within the regional and sectoral contexts and to formulate practical recommendations for reducing inequality. The methodological basis of the research includes quantitative and qualitative methods of analysis, as well as general scientific approaches – systematisation, comparison, analogy and descriptive statistics. The empirical database is based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan for 2000-2024, as well as materials from the World Health Organisation and the World Bank. The results of the study showed a steady advantage of women in life expectancy throughout the country. In 2023, the average life expectancy in Kazakhstan was 75.1 years, with 70.99 years for men and 79.06 years for women, corresponding to a gender gap of 8.07 years. The highest life expectancy values were recorded in the cities of republican significance - Almaty (78.28 years) and Astana (78.09 years), as well as in the southern agricultural regions. The minimum life expectancy is observed in the industrial regions of East Kazakhstan (73.2 years) and Karaganda (73.43 years), where mining and processing industries with increased occupational risks prevail. An analysis of the sectoral structure revealed that regions dominated by services, education, and public administration demonstrate higher life expectancy.

Keywords: Gender, Gender Gap, Life Expectancy, Regional Analysis, Sectoral Factor, Population Health, Demography, Labour Protection, Social Development

SCSTI: 91.41.27

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1. INTRODUCTION

The life expectancy of the population is a key indicator of the country's socio-economic development and an integral measure of societal well-being. For Kazakhstan, which is in the process of modernising its economy and reforming its social policy, the study of factors affecting life expectancy is becoming particularly relevant. In the context of demographic ageing, high sectoral specialisation of the economy, and pronounced regional imbalances, the analysis of factors determining life expectancy is especially relevant in the gender context.

Several studies show that the gender gap in life expectancy is formed in a complex way: biological factors interact with socio-behavioural (smoking, alcoholism), economic (income level, employment), as well as with access to medical care (Lopez et al., 2002; Sanderson et al., 2016; Mateos et al., 2020). At the same time, global studies emphasise that biology explains only part of the differences, and economic and behavioural factors play a significant role (Hao et al., 2020; Zarulli & Salinari, 2024).

In many countries, the average life expectancy of women is longer than that of men. However, the average indicator hides variations within the country, among regions and industries. Let us consider industry affiliation (employment, working conditions) and regional specifics. We can identify which professions and regions are associated with increased risks and how they affect men and women differently.

There is a steady gender gap in favour of women in Kazakhstan: according to 2023 data, the average life expectancy was 75.1 years, with women living on average 7-8 years longer than men. The gender gap is accompanied by pronounced regional differentiation, reflecting differences in the level of urbanisation, environmental conditions, access to medical care, and the structure of the economy. Thus, in industrial regions (Karaganda and Pavlodar regions), life expectancy is lower than the national average, primarily due to the impact of harmful production factors and environmental stress. On the contrary, in the southern agricultural regions and large cities (Almaty, Astana), life expectancy is higher due to a combination of better access to medicine, a more favourable environmental situation, and employment of the population mainly in the fields of services, education, and management.

A special place in the formation of gender differences is the sectoral factor that determines the working conditions, the level of occupational risks and the socio-economic status of the population. Men are more likely to be employed in the extractive and construction industries, transport and industry sectors, with increased mortality from external causes and occupational diseases. Women are more involved in social and service activities due to more favourable working conditions and access to medical services. Thus, the gender gap in life expectancy manifests itself not only as a biological or behavioural difference but also as a reflection of structural imbalances in the economy and employment.

The need for a comprehensive analysis of gender differences in life expectancy in regional and sectoral contexts determines the relevance of this study. Such a study allows us to identify spatial patterns and regional clusters with different dynamics of life expectancy; to identify industries in which occupational risks contribute most to the gender gap; and to propose targeted health, occupational safety, and social protection policies.

The purpose of the article is to identify key gender differences in the life expectancy of Kazakhstan's population within the regional and sectoral contexts and to formulate practical recommendations for reducing inequality. To achieve this goal, statistical data from official sources are used, and quantitative and qualitative analyses of the dynamics and structure of indicators are carried out. The determinants underlying the identified differences are then discussed. Thus, the study of gender differences in life expectancy within regional and sectoral contexts has significant scientific and practical importance.

2. LITERATURE REVIEW

The study of gender differences in life expectancy over the past decades has become one of the key areas of demographic and socio-medical research. The results of international research indicate that biological differences play an important but not decisive role: the persistent gender gap in life expectancy is primarily explained by social conditions, employment patterns, access to medical services, occupational risks, and lifestyle (WHO, 2023; World Bank, 2024). These patterns are confirmed for both high-income and transition economies. The systematisation of international and national scientific experience allows us to build an analytical framework for research, compare key approaches and identify areas that require further deepening.

The analysis of the sources shows. The gender gap in life expectancy remains in the international context, but its magnitude depends on the country and changes over time (Sanderson et al., 2016; Mateos et al., 2020). The study of scientific literature on gender differences has enabled the classification of worldwide research into areas that explain these differences. A large number of modern studies show that gender differences in life expectancy are formed due to the interaction of biological, behavioural and social factors (Zarulli & Salinari, 2024).

Researchers identify a combination of biological factors, such as genetics (for example, the XX chromosome in women), hormonal differences that may give some advantage to women, and behavioural risks, as key drivers of higher mortality in men at most ages. At the same time, trends are changing: in several countries, the gender gap is narrowing due to lifestyle changes (an increase in smoking among women, a decrease in male mortality). It should be noted that biological differences explain only part of the difference. However, behavioural risks (smoking, alcohol consumption), external causes of death (risky professions, accidents, injuries, violence) and socio-economic factors (income level, access to medical care) play a leading role. These factors operate independently of the industry, but their influence can be amplified in hazardous industries (Smith & Sinkford, 2022; Pinho-Gomes et al., 2023). However, many studies remain at the level of a general analysis of mortality by age, gender, and socio-economic status.

In this regard, there are several characteristic points in Kazakhstan. Firstly, non-communicable diseases—cardiovascular and oncological—make the main contribution to mortality, which is especially noticeable in adults and the elderly. This is reflected in the indicators and increases regional differences in life expectancy (Davletov et al., 2014). Secondly, several studies have noted the influence of alcohol consumption and external causes of death (accidents, injuries, suicides) on male mortality, especially in the northeastern and some other regions (Davletov et al., 2015). Finally, studies show ethnic and spatial differences in mortality rates (for example, higher rates among ethnic Russians compared to Kazakhs), which also affect regional patterns (Sarsembayeva et al., 2025).

The existing differentiation between regions often reinforces gender differences. In less developed regions or rural areas with poorer living conditions and poorer access to medical care, the gender gap may be larger or distorted due to high mortality from external causes. Regional studies in Kazakhstan indicate a high proportion of cardiovascular diseases and a significant contribution of external causes and alcohol-related problems to male mortality in several areas. Many studies have shown that regional inequalities (income levels, access to medicine, and the environmental situation) affect both absolute life expectancy and the gender gap: depressed regions exhibit both lower life standards and substantial variations in the gender gap. This situation is typical for many countries, as confirmed by studies conducted in the UK and the USA, which show stable differences in the directions of "north-south" or "city–province" (WHO, 2023).

The indicator of life expectancy is closely related not only to the level of healthcare, the environmental situation and social conditions, but also to the peculiarities of professional employment of the population. Profession, employment, and skill level determine access to medical services, as well as income, lifestyle, and the impact of occupational factors on health (Omirgazy, 2025). However, it should be noted that there are relatively few publications in the world's scientific literature that would break down life expectancy by profession/industry and gender in multinational contexts with regional details. For example, a study by Detre et al. (2001) compares the mortality rate of men and women who worked in comparable senior positions. They found that women in such positions demonstrated significantly lower mortality rates, even when controlling for the exact job requirements. That is, corporate, administrative, or "high-status" positions can make a difference in their health effects, at least in developed countries. The importance of the industry factor is noted: professions with increased injury and harmful conditions correlate with a lower life expectancy, and men are more represented in these sectors, which partially explains gender differences (Hemström, 1999). At the same time, there are practically no studies that simultaneously study life expectancy by gender, industry, and region.

Connection with the "main profession-type of employment". The article "Happiness and life expectancy by main occupational status" shows that for both men and women, life expectancy differs depending on the type of occupation: a person in a leadership position often has advantages over workers in manual labour or with a high level of risk (Lozano & Solé-Auró, 2021). This is consistent with the hypothesis that professions with high workload, harmful working conditions, stress, or physical risks can reduce life expectancy, and the impact may vary by gender.

Studies that purposefully compare life expectancy by profession or industry show systematic differences: workers in hazardous industries (mining, construction, transport, heavy industry) have a lower life expectancy than white-collar workers. Individuals directly assess their "occupation-based life expectation" and relate the difference to health status, working conditions, and socio-economic status. These effects are often more pronounced in men, as the proportion of male employment in hazardous industries is higher (Deeg et al., 2021).

In Kazakhstan, there is practically no open research with an industry breakdown; however, several works can be noted that provide indirect information and context. Thus, the article examines how socio-economic factors (income, employment, education) affect the life expectancy of men and women in Kazakhstan in recent years; however, a detailed breakdown by industry is not provided (Sarsembayeva et al., 2025). The authors of the article investigate gender inequality in the labour market in Kazakhstan, analysing labour activity, wage differences, and the employment of men and women in different sectors. However, the study practically does not address life expectancy. The Asian Development Bank proposed the gender assessment of Kazakhstan based on an analysis of the economic activity of women and men, and the distribution by economic sector (ADB, 2013). At the same time, the report notes that women are more likely to participate in the informal sector, while men are more likely to participate in the formal sector, sometimes working in more "dangerous" industries (ADB, 2013). This is important because when working in a more dangerous industry, their life expectancy can be statistically reduced. The Report "Gender Policy in modern Kazakhstan" provides an analysis of institutional, social aspects and gender differences in access to resources, healthcare, etc., which indirectly affects life expectancy (Nikolaeva, 2022). The OECD report "Gender Gaps in Eurasia: Global and Regional Context" discusses gender gaps in health, economic activity, and other important issues for the countries of the region, including those in Central Asia (OECD, 2021). However, these reports do not provide a breakdown by profession.

Studies of gender differences in life expectancy and their causes, along with social, value, and behavioural factors, conducted in neighbouring countries, provide a sound methodological and theoretical background. However, they rarely address the sectoral section of employment (Rodionova & Kopnova, 2020). In 2024-2025, articles and reports were published analysing the regional dynamics of mortality in Kazakhstan (including studies on causes of death and regional trends). Open academic publications reveal significant regional differences and the increasing role of noncommunicable diseases; however, there is a notable lack of direct industry breakdowns (life expectancy by industry and gender within regions) in open sources (Aimyshev et al., 2025).

3. METHODOLOGY

The research methodological basis combines quantitative and qualitative analysis methods with general scientific approaches, providing a comprehensive study of gender differences in the life expectancy of Kazakhstan's population across regional and sectoral contexts. The application of a multi-level approach makes it possible to take into account a set of biological, behavioural and structural factors that determine life expectancy, as well as to identify spatial and sectoral patterns of gender gap formation.

The empirical base of the study was formed using official statistical materials from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (BNS RK) covering the period 2000-2024. Additionally, data from international organisations such as the World Health Organisation (WHO) and the World Bank were used, as well as the results of national and foreign studies on mortality, regional differentiation of health and gender differences. The statistical data are aggregated by region and type of economic activity, which makes it possible to ensure their comparability and systematic analysis.

The following methods were used in the study: systematisation, comparison, analogy and descriptive statistics. The quantitative analysis included:

(1) trend analysis of the dynamics of life expectancy for men and women by country and region, highlighting the stages of growth, decline and recovery after the COVID-19 pandemic;

(2) regional decomposition of indicators with identification of spatial clusters and regions with consistently high and low life expectancy values;

(3) sectoral profiling of regions by dominant types of economic activity (mining, agriculture, services, education, public administration, etc.) in order to identify the relationship between the sectoral structure of the economy and public health;

(4) causal decomposition of the gender gap with the determination of the contribution of male and female mortality to changes in aggregate indicators;

(5) event analysis for 2020-2021, which allowed us to take into account the short-term effects of the pandemic.

Indicators and variables

The key indicator is life expectancy at birth, differentiated by gender, region, and dominant industries. The level of urbanisation, employment structure by type of economic activity, availability of medical services, environmental parameters, and socio-economic characteristics of the regions were used as additional variables. The gender gap was calculated as the absolute difference between the life expectancy of women and men in the corresponding regional and sectoral groups.

4. ANALYSIS AND RESULTS

It has been reported by the Bureau of National Statistics of the Republic of Kazakhstan (2023) that the average life expectancy in Kazakhstan amounts to 71.5 years, the average for males reaching 67.8

years, and the average for females reaching 75.1 years. This information indicates a sustained gender gap of around 7–8 years, consistent with patterns observed in various post-Soviet countries, and significantly higher than the average gap found in European Union member states, where discrepancies typically range from 4 to 5 years. These disparities are a testament to the complex combination of behavioural, occupational, and healthcare-oriented factors that consistently impact the demographic profile and the outcomes for public health in Kazakhstan (Table 1).

TABLE 1. Life expectancy: Kazakhstan, 2022 and 2023

Category	2022 (years)	2023 (years)	Absolute increase
Kazakhstan (average)	74,44	75,09	+0,65
Men (average)	70,26	70,99	+0,73
Women (average)	78,41	79,06	+0,65
Almaty city	77,32	78,28	+0,96
Ulytau region	71,44	72,41	+0,97

Note: compiled from the source Bureau of National Statistics (2023)

Based on Table 1, there is clear evidence of an overall improvement in the health of the population of Kazakhstan. The positive dynamics, an annual increase in life expectancy of more than 0.6 years, reflect gradually improving living conditions and advancements in healthcare, including better access to medical services, enhanced disease prevention, and a reduction in mortality rates. Despite this general progress, a persistent gender gap in life expectancy remains: in 2023, women lived on average 8.1 years longer than men, a difference that, while slightly less pronounced statistically than in previous years, continues to be a significant demographic feature. Notably, both the city of Almaty and the Ulytau region demonstrated substantial improvement in life expectancy, with an increase of approximately one year. This positive change can be attributed to different factors: in Almaty, the effect is likely linked to the presence of a well-developed healthcare system and higher living standards. At the same time, in Ulytau, it may be associated with the implementation of targeted state programs aimed at improving medical infrastructure and quality of life in remote regions. Over the ten years from 2014 to 2023, Kazakhstan's overall life expectancy showed a consistent upward trend, except for the temporary decline in 2020–2021 caused by the COVID-19 pandemic. Nevertheless, the gap between men and women has remained significant, averaging around eight years nationwide, as illustrated in Figure 1, confirming that gender-based differences in health outcomes persist despite overall improvements in population well-being.

The most prominent pattern recognised in Kazakhstan shows a stable increase in life expectancy from the early 2000s onward, building upon a decline in the 1990s. This favourable trajectory was disrupted in 2020–2021 due to the COVID-19 pandemic's effects, followed by a gradual recovery from 2022 onward until 2024. Regardless of these fluctuations, the gender gap in life expectancy has experienced relative stability, oscillating between six and ten years for most regions, with females living longer than males. Particularly, the time span between 2000 and 2010 was characterised by a stable growth in life expectancy, which coincided with the country's recovery from the socio-economic challenges experienced during the previous decade, while the gender gap itself stayed the same.

Between 2010 and 2019, Kazakhstan experienced additional stable improvements that were traceable to enhanced healthcare service delivery, socioeconomic growth, and increased access to healthcare services.

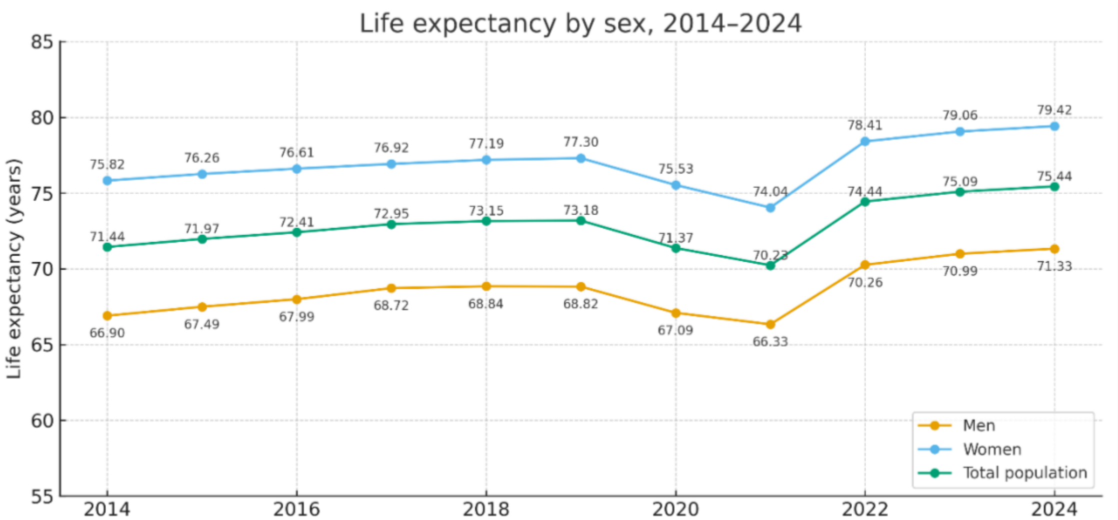

Figure 1. Life expectancy in Kazakhstan by gender

The 2020–2021 period accumulated a notable decline in life expectancy due to the effects of the COVID-19 pandemic, which disproportionately affected males mainly because of elevated mortality from accidents and injuries and cardiovascular disease. Life expectancy resumed growth between 2022 and 2024, reaching a total average of 75.44 years by the end of 2024, which indicates that the long-term trajectory has resumed its positive direction. However, significant geographical disparities remain evident: life expectancy remains the highest for the south regions—South Kazakhstan, Zhambyl, and Turkestan—averaging 73–74 years, while the lowest levels are realised in East Kazakhstan and Karaganda regions at around 69–70 years. These discrepancies highlight the persistent effects of the regional socio-economic conditions, healthcare access, and environmental factors on the population's health outcomes across the country (Table 2).

TABLE 2. Current life expectancy in Kazakhstan

Region	2023 (total)	Men	Women	Gender gap (years)
Kazakhstan	75.09	70.99	79.06	8.07
Abaya	74.14	69.74	78.30	8.56
Akmola region	74.25	69.77	78.81	9.04
Aktobe region	74.71	70.76	78.45	7.69
Almaty region	74.53	71.03	78.22	7.19
Atyrau region	75.29	70.96	79.33	8.37
West Kazakhstan region	74.08	69.51	78.69	9.18
Zhambyl region	75.25	71.13	79.36	8.23
Zhetysu region	74.64	70.55	78.64	8.09
Karaganda region	73.43	68.67	77.84	9.17
Kostanay region	73.65	68.99	78.12	9.13
Kyzylorda region	74.58	71.04	78.10	7.06
Mangystau region	75.84	71.58	79.90	8.32
Pavlodar region	74.33	69.63	78.71	9.08
North Kazakhstan region	73.13	68.21	78.10	9.89
Turkestan region	74.94	71.65	78.34	6.69

Ulytau region	72.41	68.04	76.95	8.91
East Kazakhstan region	73.20	68.60	78.00	9.40
Astana city	78.09	74.23	81.28	7.05
Almaty city	78.28	74.47	81.43	6.96
Shymkent city	76.32	72.60	79.56	6.96

Note: Compiled based on World Bank (2023); Bureau of National Statistics (2023)

This differentiation is explained by the level of urbanisation, environmental conditions (especially in the east and in industrial centres), and the availability of medical care. In cities of national importance (Astana, Almaty), life expectancy has developed above the national average due to the concentration of medical centres, educational institutions and jobs with a high level of qualifications. In industrially developed regions (Karaganda, Pavlodar regions), the impact of industrial risks associated with metallurgy, coal industry and chemistry is observed, which reduces life expectancy. In rural and agricultural regions (Zhambyl and Turkestan regions), indicators depend on the level of infrastructure, availability of medicine, and quality of working conditions in agriculture.

Figure 2 shows life expectancy (in years) for each region, and the colour of the column reflects the primary industry that has the most significant impact on public health. The red dotted line shows the national average.

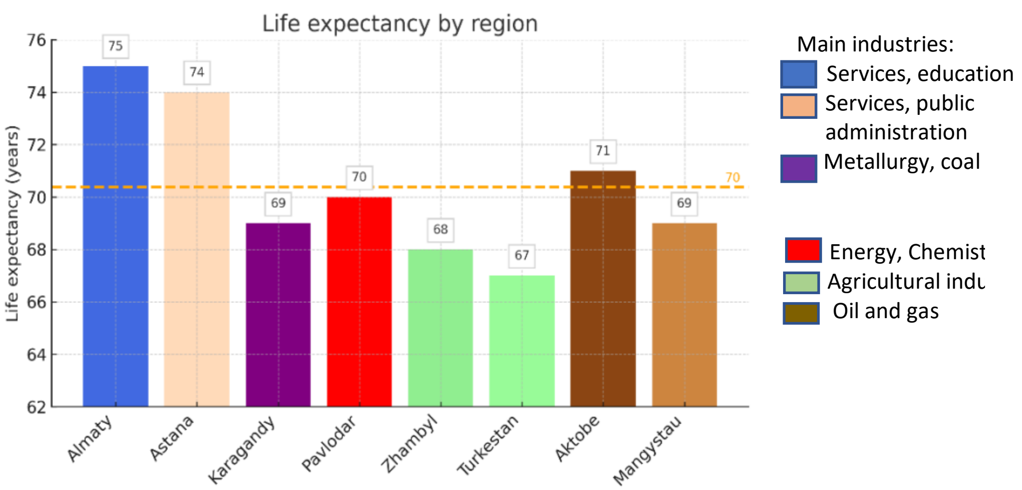

Figure 2. Life expectancy and primary industries affecting public health by region of Kazakhstan

Public health is an integral indicator of the country's sustainable development. In Kazakhstan, where the economy is primarily focused on the raw materials sector, the influence of the sectoral structure on demographic indicators, including life expectancy and morbidity, is particularly pronounced.

The sectoral structure of Kazakhstan's economy has a direct impact on public health. The specifics of industries form different production risks, social working conditions and environmental stress, which together affect the level of health. Thus, workers in the construction and manufacturing industries are at risk of injury due to exposure to building materials and chemicals. Harmful working conditions significantly impact health, encompassing chemical emissions, radiation exposure (such as in uranium mines), gas contamination of mines, a high level of occupational diseases (like silicosis, respiratory diseases, and skin diseases), and a risk of injury and premature mortality among employees. High mortality rates from respiratory diseases and cardiovascular diseases are recorded in industrial regions (Karaganda, Pavlodar, and East Kazakhstan regions). These regions traditionally show lower life expectancy rates compared to the south of the country. Work in extractive industries (oil, gas, coal, metallurgy) is characterised by increased occupational risks, including air pollution, harmful working conditions, and high rates of occupational morbidity. This reduces the life expectancy of workers and residents of industrial regions (Atyrau, Mangystau, Karaganda regions).

It should be noted that Atyrau, Mangystau, and Karaganda regions record lower life expectancy (69-72 years for men), which is associated with the concentration of extractive industries.

The sectors of Kazakhstan's economy that have a negative and positive impact on public health are shown in Figure 3.

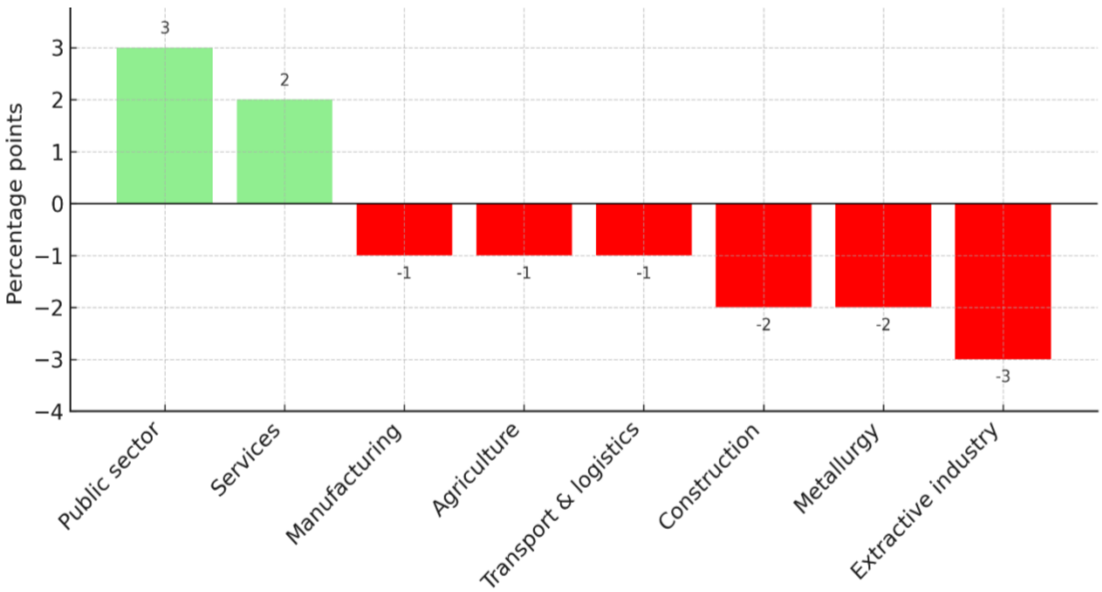

Figure 3. The impact of Kazakhstan's economic sectors on public health

In Figure 3, sectors of Kazakhstan's economy that are harmful to public health are colored red, while those that are beneficial are colored green. On average, women living in Kazakhstan have a longer life expectancy by 7–9 years compared to men, a gap that is mainly accounted for by differences in employment patterns, working conditions, and living style. Women are underrepresented in the sectors of mining and heavy industry and are concentrated in education, services, and healthcare sectors that are affiliated with working conditions that are comparatively safe, greater social participation, and a better work–life balance. Men, by contrast, are concentrated in the extractive industry, construction work, and transportation, where work-related accidents are disproportionately high and circulatory diseases are widespread. Additionally, higher levels of smoking and alcohol consumption in men further exacerbate the gender gap in longevity. Occupations that are labelled intellectual or knowledge-oriented, such as scientists, teachers, and civil servants, are aligned with longer lifespans. Occupants of physically strenuous or dangerous jobs have shorter life expectancies. Hence, the gender gaps in longevity evident from Kazakhstan are a marker of a complicated interaction between biological, occupational, and socio-economic factors.

The principal obstacles that persistently impact life expectancy throughout the various regions of Kazakhstan encompass elevated morbidity rates among employees in heavy industries, inadequate career guidance and the prevention of occupational diseases, alongside a low level of investment in the development of human capital across numerous industrial and rural areas. To rectify these inequities and enhance public health outcomes, it is imperative to mitigate occupational hazards in the extractive and industrial sectors via technological modernisation, improved working conditions, and a progressive transition towards a green economy. The establishment of regional professional development and retraining programs will help reduce occupational risks and promote employment in safer sectors. Preventive medicine must be reinforced within enterprises through the advancement of occupational health services, the implementation of regular medical examinations, and the execution of awareness campaigns. Furthermore, the disease prevention framework should be broadened by enhancing screening initiatives, facilitating early diagnosis, and encouraging the adoption of healthy lifestyles. In remote and sparsely populated regions, such as Ulytau and the northern territories, the deployment of mobile healthcare and telemedicine services is vital to guarantee equitable access to medical care.

The promotion of retraining initiatives for employees in heavy industry is essential to support their transition into safer employment sectors, including services, construction that adheres to improved safety regulations, or the information technology field. It is imperative to enhance occupational safety and environmental management through compulsory audits and ongoing monitoring, especially in high-risk areas such as Atyrau, Mangystau, Pavlodar, and Karaganda. Social protection strategies should include targeted financial assistance for at-risk populations and elderly individuals in areas with low life expectancy. In formulating regional policies, it is crucial to prioritise the enhancement of medical service accessibility in rural and environmentally compromised locations. Furthermore, gender-sensitive health care policies must be established to mitigate premature mortality rates among males and to tackle behavioural health concerns linked to smoking, alcohol usage, and hazardous working environments.

To achieve sustainable improvements in public health and reduce inequities associated with area, sector, and gender in life expectancy, Kazakhstan needs to expand its investment in human capital by emphasising education, retraining programs, and the creation of environmentally secure and sustainable jobs. Further, it is imperative to extend assistance for established workers through flexible work arrangements so that their social engagement may be encouraged and their income security ensured. Finally, utilising the "Healthy Life Expectancy" index as a key indicator for assessing social policy effectiveness would lead to a more accurate evaluation of population health improvements and provide a sound analytical platform for deriving evidence-based policy at both regional and national levels.

5. CONCLUSION

The gender gap in life expectancy in Kazakhstan remains a significant challenge for public health policy and requires a comprehensive approach that addresses behavioural, medical, and regional determinants simultaneously. Reducing this disparity demands coordinated efforts aimed at preventing behavioural health risks, improving accessibility and quality of medical services, and strengthening regionally differentiated social and health policies. To achieve this, it is essential to identify industries and regions with elevated mortality rates to direct occupational safety initiatives, alcohol and tobacco prevention programs, and improve access to healthcare and emergency medical services. Interventions must consider gender-specific employment characteristics, ensuring that preventive measures are tailored to the distinct risk profiles of men and women—for example, enhancing occupational safety and the prevention of noncommunicable diseases among men, and expanding access to preventive and reproductive healthcare services for women. Regionally targeted prevention programs should be developed and implemented, focusing particularly on the working-age male population, with an emphasis on regular medical check-ups, early diagnosis, and promoting healthy lifestyles. It is also crucial to strengthen measures to reduce alcohol consumption and prevent injuries, including through stricter enforcement of occupational safety standards and initiatives to reduce road traffic accidents. Improving the availability of primary and specialised healthcare in remote and sparsely populated areas is another important direction, which can be achieved through the expansion of telemedicine, mobile medical teams, and outreach services. Equally vital is the enhancement of the national health monitoring system, ensuring the collection and publication of detailed, disaggregated data by gender, age, and causes of death to enable timely assessment of the effectiveness of public health interventions. By implementing these broad-based measures, Kazakhstan can significantly reduce gender differences in life expectancy and work towards a healthier, more equitable society.

Moreover, achieving sustainable improvements in life expectancy requires a commitment to long-term investments in human capital and the creation of health-promoting environments. This endeavour requires the promotion of collaboration across various sectors, including healthcare, education, labour, and environmental agencies, to tackle the fundamental causes of health disparities. Initiatives aimed at raising public awareness should be broadened to promote responsible health practices, early disease prevention, and the maintenance of mental health. Educational institutions and workplaces hold significant potential to contribute by incorporating health education, stress management, and wellness initiatives into their operations.

Additionally, providing incentives from both corporate and governmental bodies for businesses that adopt innovations in occupational health and safety, support employee wellness, and shift towards cleaner, safer technologies will enhance working conditions. By integrating preventive healthcare with comprehensive economic and social reforms, Kazakhstan can establish a basis for equitable and inclusive development, ensuring that advancements in life expectancy are advantageous for all demographic segments equally.

AUTHOR CONTRIBUTION

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REFERENCES

Aimyshev, T., Zhakhina, G., Yerdessov, S., Akhmedullin, R., Galiyeva, D., Yergaliyev, K., Sarría-Santamera, A., Semenova, Y., & Gaipov, A. (2025). Mortality trends in Kazakhstan: insights from a million deaths from 2014 to 2022. *BMC Public Health, 25*. https://doi.org/10.1186/s12889-025-23346-3

ADB. (2013). *Kazakhstan: Country gender assessment*. Mandaluyong, Philippines: Asian Development Bank.

Bureau of National Statistics of the Republic of Kazakhstan. (2023). *Statistical yearbook of the Republic of Kazakhstan*. https://stat.gov.kz

Davletov, K., McKee, M., Berkinbayev, S., Battakova, Z., Zhussupov, B., Amirov, B.M., Junusbekova, G., & Rechel, B. (2014). Ethnic differences in all-cause mortality rates in Kazakhstan. *Public health, 133*, 57-62. https://doi.org/10.1016/j.puhe.2015.11.026

Davletov, K., Mckee, M., Berkinbayev, S., Battakova, Z., Vujnović, M., & Rechel, B. (2015). Regional differences in cardiovascular mortality in Kazakhstan: further evidence for the 'Russian mortality paradox'? *European journal of public health, 25*(5), 890-894. https://doi.org/10.1093/eurpub%2Fckv019

Deeg, D., De Tavernier, W, & de Breij, S. (2021). Occupation-Based Life Expectancy: Actuarial Fairness in Determining Statutory Retirement Age. *Frontier in Sociolofy, 23*, 675618. https://doi.org/10.3389/fsoc.2021.675618

Detre, K.M., Kip, K.E., Feinleib, M., Matthews, K.A., & Belle, S. (2001). Mortality of Men versus Women in Comparable High-level Jobs: 15-Year Experience in the Federal Women's Study, *American Journal of Epidemiology*, *154*(3), 221–229, https://doi.org/10.1093/aje/154.3.221

Hao, L., Xu, X., Dupre, M.E., Guo, A., Zhang, X., Qiu, L., Zhao, Y., & Gu, D. (2020). Adequate access to healthcare and added life expectancy among older adults in China. *BMC Geriatr* 20, 129. https://doi.org/10.1186/s12877-020-01524-9

Hemström, O. (1999). Does the work environment contribute to excess male mortality?Social Science & Medicine, 49(7), 879-894. https://doi.org/10.1016/S0277-9536(99)00172-0

Lopez, A.D., Ahmad, O.B., Guillot, M., Ferguson, B.D., Salomon, J.A., Murray, C.J., Hill, K.H., & Guilot, M. (2002). *World mortality in 2000: life tables for 191 countries*. World Health Organization.

Lozano, M., & Solé-Auró, A. (2021). Happiness and life expectancy by main occupational position among older workers: Who will live longer and happy? *SSM - Population Health, 13,* 100735. https://doi.org/10.1016/j.ssmph.2021.100735

Mateos, J.T., Fernández-Sáez, J., Marcos-Marcos, J., Álvarez-Dardet, C., Bambra, C., Popay, J., Baral, K.P., Musolino, C., & Baum, F.E. (2020). Gender Equality and the Global Gender Gap in Life Expectancy: An Exploratory Analysis of 152 Countries. *International Journal of Health Policy and Management, 11*, 740 - 746. https://doi.org/10.34172/ijhpm.2020.192

Nikolaeva, O. V. (2022). *Analytical report on the results of the sociological study "Gender policy in modern Kazakhstani society".* Astana: Kazakhstan Institute of Public Development.

Omirgazy, D. (2025). Kazakhstan's Life Expectancy Hits 75.4 Years, With Women Living 8 Years Longer Than Men. - Astana Times, 2025. Retrieved August 13, 2025, from https://astanatimes.com/2025/03/kazakhstans-life-expectancy-hits-75-4-years-with-women-living-8-years-longer-than-men/?utm_source=chatgpt.com

OECD. (2021). *Gender gaps in Eurasia: The negative consequences of COVID-19*. Paris: OECD Publishing.

Pinho-Gomes, A., Peters, S.A., & Woodward, M. (2023). Gender equality related to gender differences in life expectancy across the globe gender equality and life expectancy. *PLOS Global Public Health, 3*(3), e0001214. https://doi.org/10.1371/journal.pgph.0001214

Rodionova, L.A., & Kopnova, E.D. (2020). Gender and Regional Differences in the Life Expectancy in Russia. *Voprosy statistiki, 27*(1),106-120. (In Russ.) https://doi.org/10.34023/2313-6383-2020-27-1-106-120

Sanderson, W.C., & Scherbov, S. (2016). A New Perspective on Patterns of Aging in Europe by Education and Gender. *Journal of Population Ageing, 9*, 207-225. https://doi.org/10.1007/S12062-015-9125-Z

Sarsembayeva, G.Zh., Bordiyanu, I.V., & Mubarakov, Y.Y. (2025). Gender aspects of the impact of the socio-economic environment on life expectancy. *Central Asian Economic Review*,3, 22-38. (In Russ.) https://doi.org/10.52821/2789-4401-2025-3-22-38

Smith, S.G., & Sinkford, J.C. (2022). Gender equality in the 21st century: Overcoming barriers to women's leadership in global health. *Journal of dental education, 86 9*, 1144-1173. https://doi.org/10.1002/jdd.13059

World Bank. (2023). *Gender statistics*. Retrieved August 13, 2025, from https://databank.worldbank.org/source/gender-statistics

World Bank. (2024). *Country and lending groups*. Retrieved October 14, 2025, from https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

WHO. (2023). *The Global Health Observatory*. Retrieved October 14, 2025, from https://www.who.int/data/gho

Zarulli, V., & Salinari, G. (2024). Gender differences in survival across the ages of life: an introduction. *Genus, 80,* 10. https://doi.org/10.1186/s41118-024-00216-1

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