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DEMOGRAPHIC DIVIDEND IN CENTRAL ASIA

by

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THESIS BOOKLET

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Contents

1. Theoretical background and justification of the topic

Over the past five decades, almost all countries of the world have undergone significant demographic transitions characterized by declining fertility and mortality rates. These transitions have had varying effects on economies, with developed countries facing aging populations, while less developed nations stand to benefit from demographic tailwinds, marked by an increasing share of the working-age population. The age structure, reflecting the relationship between the working-age population and dependents, is a robust indicator of future economic prospects (Gentile, 2007).

The period when the working-age population outnumbers dependents is commonly referred to as the "demographic window of opportunity" (Lee & Mason, 2010). This window signifies potential economic gain that can be harnessed when a large proportion of the population is of working age, the so-called "demographic dividend" (Bloom et al., 2003; Bloom & Williamson, 1998), resulting in greater income generation than consumption (Gentile, 2007; Gribble & Bremner, 2012; Kelley & Schmidt, 2005). However, this potential can only be realized if several conditions are met, including improvements in healthcare and education, effective governance, and increased participation of women in higher education and the workforce.

The demographic dividend is an especially relevant and timely topic in emerging countries, including those in Central Asia—Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. These nations are characterized by diverse cultures, ethnicities, and socio-economic contexts. The shifting demographics in this region present temporary opportunities. Therefore, it is crucial to understand which socio-economic and demographic factors contribute to or hinder economic growth and poverty reduction, particularly during this demographic window of opportunity. Despite the importance of the topic, the literature on Central Asian demography has been limited, especially empirical studies, and the region is highly understudied in the literature. Thus, providing further information could be a very useful contribution.

Additionally, the effect of the governance effectiveness indicator during an age-structure transition has received less attention. While there is extensive literature on its importance for economic growth, empirical studies in this area remain relatively rare, particularly regarding Central Asia. Therefore, the second goal of this paper is to present a more comprehensive economic growth, poverty, and inequality model that includes demographic, economic, human capital, and governance indicators at a regional level. By adding the governance effectiveness indicators, the thesis tests whether governance factors matter for economic growth in Central Asia (Coppedge et al., 2021; Lindberg, 2015). Through this analysis, we intend to investigate how the phenomenon known as "the demographic window of opportunity" plays out differently in Central Asian countries. Moreover, our aim is to discover what reasons lie behind the demographic dividend's differing results in these countries.

To fill the research gap and achieve our objectives, in this thesis, we will examine the effects of the demographic window of opportunity in different directions: economic growth, poverty, and inequality.

Initially, we will examine how the shifting demographic composition affects economic growth. The same phase of the first demographic dividend allows us to identify the main drivers of economic growth by examining data from the five Central Asian states in single panel estimation through appropriate methods.

The next direction of the research is to analyze the impact of the demographic transition on the reduction of poverty and inequality in Central Asia. Poverty in the context of ageing poses serious challenges. While the economies of all countries in the region are growing, the fight against poverty has stagnated. The central question revolves around whether this stagnation is attributed to the rising number of working-age individuals or if the region can harness this demographic change to effectively diminish poverty. Also, we will explore what challenges are hindering efforts to alleviate poverty and inequality.

2. Methodology

2.1. Research questions and hypotheses

As previously mentioned, the phenomenon of the "demographic dividend" manifests uniquely across countries, even those within the same geographical area or continent. This

raises a crucial practical question: Can these countries, with diverse economic structures and ethnic compositions, effectively harness the benefits of the demographic dividend?

To unravel the complexities surrounding the impact of demographic dividends in Central Asia, this thesis poses several key research questions:

- How do shifts in population structures influence economic growth patterns in Central Asian countries?
- What role does demographic change play in shaping poverty reduction initiatives within the region?

These questions serve as guiding pillars for an in-depth exploration of the intricate relationships between demography, economics, and social dynamics. Consequently, the following hypotheses have been developed to address the research questions.

For the first empirical part:

Hypothesis 1: The same demographic and economic variables that have influenced the first demographic dividend in other countries are also crucial in Central Asia.

Hypothesis 2: In the Central Asian countries where there are many contradictory economic forces, other variables such as the level of democracy and the level of corruption also play a vital role in whether the first demographic dividend can exert its effect.

For the second empirical part:

Hypothesis 1: A higher share of the working-age population will lead to a reduction in poverty rates.

Hypothesis 2: An increasing share of the working-age individuals will initially reduce income inequality.

Hypothesis 3: Bribery will be positively correlated with higher poverty rates and income inequality.

Hypothesis 4: Poverty and inequality can be decreased with good governance.

These hypotheses are formulated to guide the empirical analysis, aiming to provide insights into the specific dynamics of demographic dividends in Central Asia. Through systematic examination, the thesis endeavours to contribute valuable knowledge that can inform policy interventions and strategic approaches for these countries, considering their unique economic and demographic landscapes.

2.2. Data selection and description

As we mentioned above, our research comprises two empirical parts. The first part involves estimating the effect of changing age structure on economic growth. For this research, the data is combined from different data sources covering 1991-2018 for each of the five countries. We have mainly used data from World Development Indicators published by the World Bank. The UNDP's Human Development Report serves as the source for the average year of schooling. The data for the quality of government, the Political Corruption Index, and the Egalitarian Democracy Index are being used from the University of Gothenburg database. The sample selection and the time period are partly based on data availability. The dependent variablein our analysis is GDP per capita. Table 1 provides detailed information about the data, including sources and measurement units.

Table 1: Data and sources for economic growth estimation

	Indicator	**Source of data**
loggdppc	Log of GDP per capita (constant 2010 US$)	World development indicators by the World Bank
WAP	The working-age share of the population (population aged 15-64, % of the total population)	World development indicators by the World Bank
CS	Gross capital formation (% of GDP)	World development indicators by the World Bank
AG	Employment in agriculture (% of total employment) (modelled ILO estimate)	World development indicators by the World Bank
SR	Employment in services (% of total employment) (modelled ILO estimate)	World development indicators by the World Bank
FL	Female labour force participation rate (% of female population ages 15+) (modelled ILO estimate)	World development indicators by the World Bank
ODR	Old dependency ratio (% of working-age population)	World development indicators by the World Bank
YDR	Young dependency ratio (% of working-age population)	World development indicators by the World Bank
$g_{L_{it}}$	Growth of life expectancy	World development indicators by the World Bank
X	Mean years of schooling (years)	Human development report by the UNDP
$g_{U_{it}}$	Growth of urban population	World development indicators by the World Bank
CR	Political corruption index	University of Gothenburg database
GI	Egalitarian Democracy Index	University of Gothenburg database

Source: edited by the author

The second part of the thesis focuses on the impact of demographic transition on poverty and inequality. Our study employs a panel of five heterogeneous Central Asian countries during the period from 1991 to 2020.

To gain a greater insight into the effects of demographic dividends on two crucial issues—poverty and inequality—our study uses two dependent variables. The selection of suitable variables to represent these two indicators is particularly challenging, especially given the scarcity of longitudinal data in the context of Central Asian countries. Consequently, our choice of indicators is driven by data availability as well as previous studies.

For our study, the data were obtained from secondary sources and databases. Poverty metrics, mean income, and inequality (presented in US$ using 2011 PPPs) are derived from the Poverty and Inequality Platform, an online poverty measurement tool developed by the Development Research Group of the World Bank. This platform draws from an extensive compilation of household surveys, making it a widely utilized resource among researchers. While the majority of the data originates from the World Bank, governance indicators were sourced from the University of Gothenburg's database. The source of each data point is reported in Table 2.

Table 2: Data and sources for poverty and inequality estimation

Symbol*	variable	Unit	Source
poverty	Poverty headcount ratio	(% of population) (2011 PPP)	Poverty and Inequality Platform
Gini	GINI index	(% of population) (2011 PPP)	
NM	Net migration rate	per 1000 population	Macrotrends-the premier research platform
X	Mean years of schooling	years	Human development report by the UNDP
MF	Material footprint per capita	tonnes	
PF	Share of seats in parliament, female	% held by women	
GDPpc	GDP per capita	Constant 2015 US $	World Bank
WAP	The share of working-age population	population aged 15-64, % of the total population	
gP	Population growth	Annual %	
LE	Life expectancy at birth	years	
OLF	Persons outside the labour force	thousands, Age: 25+	International Labor Organization
Lib	Liberal component index	ranges from 0 (not at all democratic) to 1 (fully democratic)	

Bribe	Executive bribery and corrupt exchanges	scale ranging from zero to four. A score of zero signified frequent or consistent executive corruption, while a score of four indicated an absence or near absence of executive corruption	University of Gothenburg database
GG	"Good governance" Composite index	Composite index for effective governance was created using principal component analysis. The components are given in Apendix1	Own estimation

* Variables with natural log transformations are GDP per capita, Persons outside the labour force and mean years of schooling.

Source: edited by the author

2.3. Model formulation and estimation strategy

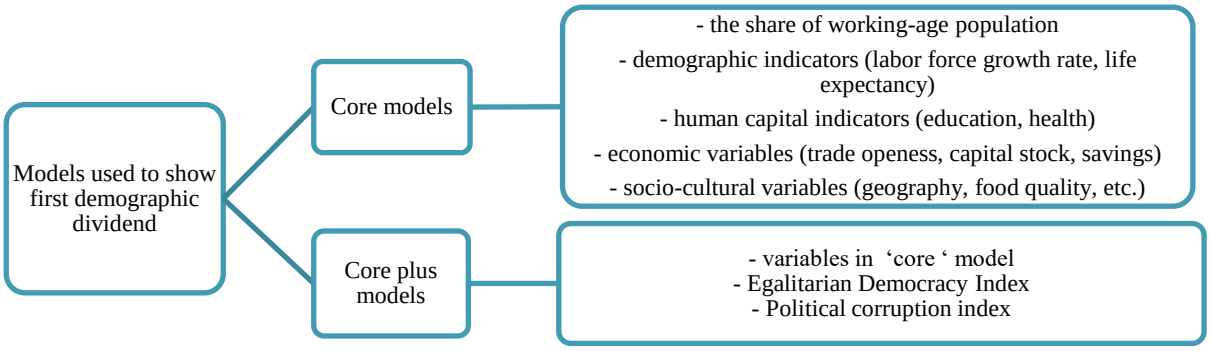
First empirical part:

In neoclassical growth models, only population growth took place as a demographic variable. However, the approach has become more differentiated in the literature, where the first demographic dividend is modelled. These models explore the returns to the working-age population and the GDP-increasing effect of the first demographic dividend. In this regard, the idea that an increasing working-age population can boost economic growth and that this potential is dependent on labour policies, macroeconomic management, and education policies is essential (Choudhry & Elhorst, 2010).

Therefore, in empirical estimations of the demographic dividend, economic growth is explained by the standard explanatory variables, which we will call "core" explanatory variables. These variables are the working-age share of the population, demographic and human development indicators, and economic and socio-cultural variables. With respect to these variables, we refer to these models as "core- models". Figure 1 illustrates the most important variables of the "core-models". We refer to the models where democracy and corruption indicators are also taken as explanatory variables as "Core-plus" models in the present paper.

We have used the Egalitarian Democracy Index and the Political Corruption Index to represent these factors.

Figure 1: Model Structure for Describing the First Demographic Dividend



Source: own research

In this research, we have used "Core models" and "Core plus models" to describe how the first demographic dividend evolved.

First, we estimate economic growth by the standard explanatory variables ("Core model"), which are given in equation (1a).

$$\text{loggdppc}_{it} = \beta_0 + \beta_1 \text{WAP}_{it} + \beta_2 \text{CS}_{it} + \beta_3 \text{AG}_{it} + \beta_4 \text{FL}_{it} + \varepsilon_{it} \quad (1a)$$

Where, i = 1, 2,… ,5 represents the cross-sectional units and t = 1, 2,…,28 is the time period and ε_{it} is the error term. The description of the data is given in table 16 above.

The alternate (b) version of the first equation, equation (1b), will also be used to examine different age groups' effects.

$$loggdppc_{it} = \beta_0 + \beta_1 ODR_{it} + \beta_2 YDR + \beta_3 CS_{it} + \beta_4 AG_{it} + \beta_5 FL_{it} + \varepsilon_{it} \quad (1b)$$

The working-age share of the population (WAP) has been swapped out for the old-age dependency ratio (ODR) and the young-age dependency ratio (YDR). This makes model (1b) different from its simpler predecessor (1a). The remaining portion of the equation is identical to that in (1a).

In addition to the first model, we have added a set of relevant indicators that help us to determine other key components of the demographic transition in economic growth estimation (the "Core plus model") in a more general way. These potential contributing indicators contain not only governance effectiveness indicators but also human development indicators. This specification is expressed as follows:

$$\text{loggdppc}_{it} = \beta_0 + \beta_1 \text{WAP}_{it} + \beta_2 \text{AG}_{it} + \beta_3 \text{SR}_{it} + \beta_4 \text{FL}_{it} + \beta_5 g_{L_{it}} + \beta_6 X_{it-2} + \beta_7 g_{U_{it}} + \beta_8 \text{CS}_{it} + \beta_9 \text{CR}_{it} + \beta_{10} \text{GI}_{it} + \varepsilon_{it} \quad (2a)$$

The increasing working-age share of the population embedded in human capital is a crucial component of the demographic dividend. It increases workers' productivity (Cruz & Ahmed, 2018) and is a key channel for transforming unskilled workers into skilled ones (Golley & Tyers, 2012). Therefore, we use the mean years of schooling as a proxy for human capital in our estimation. It is noteworthy that the previous year's capital accumulation affects economic growth in the current year. Hence, adding education with a lag seemed reasonable in our estimation, and the choice of lag in the model (2a) was based on achieving the highest significant delay. Moreover, health as a measure of human capital could be a sensible inclusion in the analysis, as the literature suggests (Ahmad & Khan, 2018; Ogundari & Awokuse, 2018). Therefore, the growth rate of life expectancy has been included in the estimation. It is assumed that having a better healthcare system causes an increase in the population's life expectancy.

Also, urbanisation is considered to be one of the main components of human capital development. In fact, infrastructure is developed in urban areas, and people are more likely to have better access to education and health. This allows them to improve the living standards of the population and increase workers' productivity (Dao, 2012). In addition, in the endogenous growth model, labor plays a significant role in driving growth and transformation; therefore, urbanization must be taken into account in order to draw accurate conclusions (Haldar & Sethi, 2022). Hence, the growth rate of the urban population was added to our estimation as a proxy

for living standards. To exploit the demographic dividend fully, well-established institutions are required. Hence, the Political Corruption Index and the Egalitarian Democracy Index were included in our model as proxies for governance effectiveness or institutional indicators.

$$loggdppc_{it} = \beta_0 + \beta_1 AG_{it} + \beta_2 SR_{it} + \beta_3 FL_{it} + \beta_4 g_{L_{it}} + \beta_5 X_{it-2} + \beta_6 g_{U_{it}} + \beta_7 CS_{it} + \beta_8 CR_{it} + \beta_9 GI_{it} + \beta_{10} ODR_{it} + \beta_{11} YDR_{it} + \varepsilon_{it} \quad (2b)$$

In model specification (2b), we focus on how the dependency ratio and additional explanatory variables impact economic growth. The principal difference in the model (2b) from its simpler predecessor (2a) is that it replaces the working-age share of the population with the old-age dependency ratio and young-age dependency ratio (henceforth the old dependency ratio and young dependency ratio, respectively). We have previously used the same practice in models (1a) and (1b). The remaining portion of equation (2b) is the same as that in the model (2a).

The abbreviation of all variables and their measurement are given in Table 1 above.

Second empirical part:

In this part, we built our models on the "Poverty-Growth-Inequality" triangle.

To test our hypothesis which are given above, related to the influence of changes in age structure, socio-economic, and demographic factors, as well as good governance indicators, on poverty and inequality reduction, we conducted regression analyses using the aforementioned indicators. Given that our analysis accounts for both regional and time effects, the models were structured as follows: Initially, we estimated the Poverty-Growth-Inequality-Bribery (P-G-I-B) Quadrangle, with a primary focus on poverty and inequality estimation, as we have mentioned above. The first poverty estimation model, as part of the quadrangle, is presented as follows (the abbreviation of all variables and their measurement are given in Table 2):

$$poverty_{it} = \beta_0 + \beta_1 logGDPpc_{it} + \beta_2 logGDPpc_{it}^2 + \beta_3 WAP_{it} + \beta_4 logOLF_{it} + \beta_5 logX_{it} + \beta_6 PF_{it} + \beta_7 g_{P_{it}} + \beta_8 NM_{it} + \beta_9 LE_{it} + \beta_{10} MF_{it} + \beta_{11} Gini_{it} + \beta_{12} logLib_{it} + \beta_{13} logBribe_{it} + \beta_{14} (logMeanIncome * logGini_{it}) + \varepsilon_{it} \quad (1)$$

In the subsequent estimations, we will repeat the same procedure but replace two governance indicators, such as the liberal component index and the executive bribery and corrupt exchanges index, with a newly constructed composite index, which we named «Good Governance».

$$poverty_{it} = \beta_0 + \beta_1 logGDPpc_{it} + \beta_2 logGDPpc_{it}^2 + \beta_3 WAP_{it} + \beta_4 logOLF_{it} + \beta_5 logX_{it} + \beta_6 PF_{it} + \beta_7 g_{P_{it}} + \beta_8 NM_{it} + \beta_9 LE_{it} + \beta_{10} MF_{it} + \beta_{11} Gini_{it} + \beta_{12} GG_{it} + \beta_{13}(logMeanIncome * logGini_{it}) + \varepsilon_{it} \quad (2)$$

Next, we will estimate the inequality model using the same technique as the poverty estimation.

$$Gini_{it} = \beta_0 + \beta_1 logGDPpc_{it} + \beta_2 logGDPpc_{it}^2 + \beta_3 WAP_{it} + \beta_4 logOLF_{it} + \beta_5 logX_{it} + \beta_6 PF_{it} + \beta_7 g_{P_{it}} + \beta_8 NM_{it} + \beta_9 LE_{it} + \beta_{10} MF_{it} + \beta_{11} Gini_{it} + \beta_{12} logLib_{it} + \beta_{13} logBribe_{it} + \varepsilon_{it} \quad (3)$$

$$Gini_{it} = \beta_0 + \beta_1 logGDPpc_{it} + \beta_2 logGDPpc_{it}^2 + \beta_3 WAP_{it} + \beta_4 logOLF_{it} + \beta_5 logX_{it} + \beta_6 PF_{it} + \beta_7 g_{P_{it}} + \beta_8 NM_{it} + \beta_9 LE_{it} + \beta_{10} MF_{it} + \beta_{11} Gini_{it} + \beta_{12} GG_{it} + \varepsilon_{it} \quad (4)$$

In the four above-mentioned equations, i denotes countries, while t represents time, β_0 is the intercept, β_1 to β_{14} denote the estimated coefficients for each variable, and ε is the error term.

In our estimations, besides economic growth, we included its square to capture non-linear relationships between economic growth (as measured by GDP per capita) and poverty and inequality, following previous scholars (Blanco & Ram, 2019; Wan et al., 2021). According to economic growth theory, the nexus between income and poverty is not strictly linear. In the beginning, as income increases, the reduction in poverty or inequality may be more significant, but at higher income levels, the impact may diminish. Including the squared term helps account for this non-linearity.

Additionally, we included the interaction term between income and the Gini coefficient in poverty estimation to represent that the poor in high-inequality countries benefit less from

economic growth. The aim of adding this variable is to indicate the effect of domestic inequalities in income distribution on poverty (Bourguignon, 2003; Ravallion, 2006; Wietzke, 2020)

2.4. Estimation strategies

This research employs a comprehensive and multi-disciplinary methodology to address the identified research questions using data from international organizations. After providing a historical overview of Central Asian countries through graphs and tables since the dissolution of the Soviet Union, we employ econometric tools to analyse the situation in more detail. Utilizing a panel fixed-effects model with Driscoll-Kraay-corrected robust standard errors, the study seeks to provide a nuanced understanding of the intricate relationships between demographic dividends, economic growth, poverty reduction, and inequality. The choice of method depends on the characteristics of the panel data.

Prior to selecting this econometric technique, several tests were conducted, including Hausman's (1978) specification test to determine whether fixed or random effects are appropriate for the estimation. Additionally, preliminary diagnostic checks were performed, such as Pesaran's (2004) CD test and Breusch-Pagan Lagrange Multiplier test for cross-sectional dependence, the Heteroscedasticity Modified Wald test for groupwise heteroskedasticity in fixed effect regression model, the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, and Wooldridge's (2002) test for autocorrelation. Based on the test results and panel data features, the recommended method is the panel fixed-effects model with Driscoll-Kraay standard errors.

Driscoll and Kraay (1998) provide a non-parametric covariance matrix estimator that yields standard errors. This method has many advantages, such as being resistant to a variety of spatial and temporal dependency patterns, consistent with heteroskedasticity and autocorrelation, and effective in handling missing data. Unlike the original covariance matrix estimator of Driscoll and Kraay's (1998), the current tool deals with balanced and unbalanced panels. Additionally, it is appropriate for studies with a long time period and fewer countries, aligning with the characteristics of our study, ultimately enhancing the precision of inference and improving the statistical validity of the estimates (Hoechle, 2007).

3. The findings of the dissertation

3.1. Study 1. The impact of demographic transition on economic growth of Central Asia: empirical analysis

Through a comprehensive historical overview, utilizing graphs and tables, we identified various challenges that impede the realization of the demographic dividend in Central Asia:

- Shortcomings in employment policies pose a significant hurdle to effectively utilizing the expanding working-age population to drive economic growth and alleviate poverty. This situation has resulted in a notable outmigration trend, particularly in countries like Tajikistan, Kyrgyzstan, and Uzbekistan.
- Issues related to education quality and human capital deficiencies persist. Limited access to tertiary education contributes to a shortage of qualified specialists.
- The gender gap in both education and employment further compounds the challenges,
- Inefficiencies in governance hinder the effective implementation of development strategies.

To empirically investigate the impact of these challenges on economic growth and poverty during the demographic transition, we employed the fixed-effect model with Driscoll-Kraay standard errors, yielded the following results:

- Our estimation demonstrates a direct link between demography and the economy. This indicates that the increase in the working-age share of the population is a potential source of the accelerating economic growth associated with the demographic dividend.
- education, taken as a proxy for human capital development, has a significant positive effect on economic growth. This result corroborates the human capital theory, which suggests that skills and knowledge, strengthened by education, improving their living standards. Investments in human capital increase the labour force engaged in the job market, boost productivity, and accelerate economic development.
- The female labour force participation rate has also been demonstrated to be one of the main elements of growth. It shows that countries can reap economic benefits from supplementary education and the empowerment of women.

- increasing the urban share of the population leads to economic growth.
- Our calculations show that the Egalitarian Democracy Index and the Political Corruption Index matter in the growth model in the demographic transition stage. This result confirms that the demographic dividend is policy-dependent, where increasing the level of egalitarian democracy accelerates economic growth, and corruption retards said growth. Thus, the greater the quality of public institutions, the more rapidly the country will develop.

3.2. Study 2. Determinants of Socio Economic and Demographic Characteristics of Poverty and inequality in Central Asian countries

The key findings of this chapter are as follows:

- Our findings reaffirm the macroeconomic benefits of the changing age structure. The increase in the share of the working-age population, representing the demographic dividend, highlights its potential for reducing poverty and inequality

- However, one of the challenges in converting the demographic dividend into poverty and inequality reduction is the existence of bribery. Thus, the significant impact of bribery allows us to extend the "Poverty-Growth-Inequality" triangle into the "Poverty-Growth-Inequality-Bribery" quadrangle.

- the environmental footprint emerges as another factor that can exacerbate poverty levels, signalling the need for sustainable development practices.

- An overarching theme that resonates throughout our findings is the pivotal role of good governance, mirroring observations from the first empirical part. Our analysis consistently emphasizes that effective governance – characterized by anti-corruption measures, institutional reforms, and sustainable resource management – is crucial for unlocking the complete benefits of the demographic dividend. It acts as an enabling force, fostering an environment conducive to equitable development, job creation, and access to essential services.

- When we extended our estimation by adding additional human-wellbeing representatives and other socio-economic variables, the results indicated that poverty is a multi-complex problem. The empirical results highlight the significant role of GDP per capita, outmigration, and democracy in decreasing poverty and inequality in the region.

- education emerges as a crucial factor for realizing the demographic dividend once again. Addressing educational disparities and facilitating pathways to higher-skilled employment are imperative steps for Central Asian countries. Higher levels of education not only equip the workforce with enhanced skills but also act as a deterrent against falling into poverty.

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1. Berde, É., & **Kurbanova, M.** (2023). Does the demographic dividend with human capital development yield an economic dividend? Evidence from Central Asia. Post-Communist Economies, 35(2), 154-178.
2. **Kurbanova, M.,** & Berde, É. (2024). Intergenerational Interaction, Financial Well-Being, and Ageism in Kazakhstan During Covid Pandemic. Journal of Intergenerational Relationships, 1-17
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