



HARNESSING DIGITALIZATION TO REDUCE DEPENDENCY ON MIGRATION: INSIGHTS FROM CENTRAL ASIA

Said Kurbonov

PhD student at Graduate School of Business and Entrepreneurship, Uzbekistan

saidkurbanov@gmail.com

Abstract

Labor migration serves as one of the primary means for individuals in transition countries to earn money when they are unable to find employment within their own countries. This trend is particularly evident in the migration corridor between Central Asia and the Russian Federation. According to estimates from the United Nations Population Division, approximately 4.96 million people from Central Asia engage in labor migration. The Russian Federation and Kazakhstan host a significant percentage, ranging from 74 to 80 percent, of registered migrants from the Kyrgyz Republic, Tajikistan, and Uzbekistan. Since 2011, remittances have played an increasingly important role in the GDPs of Tajikistan and Kyrgyzstan, surpassing those of any other country worldwide. In Tajikistan, remittances accounted for 28-43 percent of the GDP, while in Kyrgyzstan, the figure was over 30 percent. Notably, more than three-quarters of these remittances originate from the Russian Federation and Kazakhstan.

Keywords: Migration, Digitalization, Dependency, Central Asia, Russia, Emigration trap

INTRODUCTION

The reliance of Central Asian countries on remittances from labor migrants employed in Russia grants Moscow a lever that enables it to exert influence over Central Asia. Suppose, for example, that Russia were to impose restrictions on migration. In such a scenario, a portion of the migrant workers would be compelled to return to their home countries. This would lead to an increase in the unemployment rate within the migrants' home countries, thereby necessitating higher government spending on social services. Furthermore, the decrease in remittances

would result in increased poverty levels and reduced purchasing power among consumers, leading to a situation where the supply of goods and services surpasses demand. Consequently, entrepreneurs would be compelled to scale back production and lay off surplus workers. This would not only augment the population of unemployed individuals within the home country but also result in reduced tax payments by entrepreneurs, further exacerbating the government's debt burden. As this process continued, the macroeconomic equilibrium would be undermined.

The potential occurrence of this scenario raises the notion that donor countries could find themselves in an "emigration trap." The term "emigration trap" refers to a situation in which the economic stability of a country is reliant on the inflow of remittances from migrant workers abroad and is contingent upon the migration policies of destination countries. In such cases, destination countries possess the ability to utilize migration policies as a means to control or influence the economic circumstances of donor countries.

This paper aims to address the following questions:

i) How can the reliance of economies on remittances be measured, and at what stage can a country be considered to have entered the emigration trap? ii) What are the socio-economic implications for Central Asian countries when remittance levels decrease? iii) To what extent do national economies depend on the macroeconomic conditions of recipient countries? iv) How do existing migration flows compare to potential migration flows to other destination countries in terms of effectiveness? v) What measures should Central Asian states undertake to break free from the emigration trap?

To answer these questions, a combination of analytical and synthetic approaches, as well as inductive and deductive reasoning, will be employed. The study will involve comparative analysis and econometric panel modeling. Data will be sourced from datasets provided by national statistics committees and international organizations.

LITERATURE REVIEW

The existing literature on the topic can be categorized into two main streams: research focused on the migration process within Central Asian countries and studies on migration in other regions.

Starting with the literature on migration processes, causes, and consequences in countries beyond Central Asia, Shelburne and Palacin conducted a study examining the influence of remittances on economic growth and poverty reduction in transition economies. Their findings indicated that remittances had an overall positive impact on economic growth. However, they also highlighted a negative effect resulting from the emigration of skilled workers.

The researchers observed that underdeveloped financial and capital markets hindered the productive utilization of remittance inflows, limiting their potential for fostering development.

In their research on the impact of remittances on economic growth and poverty in the Asia-Pacific region, Imai et al. found a positive relationship between remittances, economic growth, and poverty reduction. However, they also noted that remittance flows could contribute to output shocks during periods of economic uncertainty. As a result, they recommended utilizing remittances for physical and human capital investments. Thagunna and Acharya, focusing on Nepal, reached similar conclusions. They suggested that directing remittances towards public infrastructure investments in developing countries could strengthen the domestic market, improve the business climate, and lead to higher economic returns, ultimately reducing migration flows and diminishing dependence on remittances. Several other scholars have examined migration processes in various countries or regions and reached similar findings, including Tambama (Zimbabwe), Abdullaev (countries of the former Soviet Union), Dilshad (Pakistan), Blouchoutzi and Nikas (Moldova and Albania), Larsson and Angman (99 developing countries), and Fagerheim (ASEAN). However, there was one study focusing on migration in sub-Saharan Africa that yielded contradictory results.

Several scholars have delved into the topic of migration flows specifically in the Central Asian context. Schrooten conducted a study examining the determinants of remittances in the countries of the former Soviet Union. The findings indicated that remittances could be partially explained by income levels. Other significant factors influencing migration and remittance patterns were the performance of the domestic banking sector, institutional quality, and the degree of international integration.

Marat explored the impact of the global financial crisis on the migration flow from Central Asia. The research concluded that the global financial crisis placed Central Asian migrants in a challenging position due to the unfavorable macroeconomic conditions in the Russian Federation.

Akmoldoev's research focused on migration flows from Kyrgyzstan. The study highlighted that the diminishing economic effectiveness of remittances could be attributed to the allocation of remittance funds towards consumption rather than investment.

These studies shed light on various factors influencing migration and remittance patterns in Central Asia.

Delovarova, Shkapyak, and Kukeyeva conducted an analysis of the "Central Asian migration system," which encompasses the five Central Asian countries and Russia. They explored the primary reasons behind Central Asian migration, as well as its consequences and challenges. The researchers recommended enhancing cooperation on key issues, both among

the Central Asian countries themselves and between Russia and Central Asia. They emphasized that Kazakhstan possesses significant potential to become a primary destination for migration and a catalyst for reforming migration cooperation within the region. Furthermore, Delovarova et al. examined this process within the broader framework of regionalism and regionalization in Central Asia. They observed a lack of developed transnational cooperation between these countries, with limited initiatives primarily originating from the Russian Federation. They further concluded that Kazakhstan has the potential to play a crucial role in driving Central Asian integration. They highlighted the underdevelopment of transnational cooperation among the Central Asian countries and suggested that Kazakhstan could help facilitate regional integration efforts.

Sultonov analyzed the impact of remittances in Tajikistan and discovered a positive correlation between remittances and imports. Given the country's high dependence on remittances, he argued that it also becomes highly reliant on imports. To maximize the positive effects of remittance flows, Sultonov recommended that the government implement a long-term policy aimed at encouraging savings and stimulating domestic production of consumer goods.

Danzer, Dietz, and Gatskova conducted an analysis of migrant stock in terms of gender, age, and income level using a household panel survey. They found that despite increasing risks faced by Tajikistani migrants in the Russian Federation, the Tajikistani government has not prioritized job creation and infrastructure improvement as measures to reduce emigration flows from the country.

Malyuchenko also explored labor migration from Central Asia to the Russian Federation. She highlighted that remittances from Russia contribute to improved living standards in the Central Asian countries by boosting consumption and domestic investments. However, due to inadequate infrastructure, these incremental improvements do not significantly impact the economic development of the Central Asian countries. Malyuchenko identified social insurance, health insurance, pension provision, and citizenship as key areas that Central Asian countries should address in negotiations with the Russian government. She further suggested the involvement of international organizations in these negotiations to enhance their effectiveness.

On the other hand, Eromenko discussed the presence of symptoms related to the Dutch disease in Kyrgyzstan and Tajikistan. This condition, caused by significant inflows of foreign currency, leads to the appreciation of the real exchange rate, a decline in tradable sectors, and an increase in non-tradable sectors. Eromenko attributed this phenomenon to the high proportion of remittances in the economies of these countries.

This research paper adds to the current knowledge on the subject by examining the impacts of emigration flows through the utilization of regression models. It also introduces a

novel measure of emigration dependence and explores methods to determine the threshold values of this measure, which can indicate whether a country is trapped in a cycle of emigration. Furthermore, the paper compares the effectiveness of different channels of migration.

TRENDS IN MIGRATION AND REMITTANCES IN CENTRAL ASIA

During the existence of the Soviet Union, its constituent republics operated as a unified economy and were not self-sufficient entities. The Central Asian countries primarily focused on agriculture, while any existing factories were designed to fit into the larger industrial structure of the Union. Following the collapse of the USSR, the need arose to establish independent economies. Russia had served as the industrial, financial, and regulatory hub of the Soviet Union; however, the country faced a low birth rate, resulting in a labor shortage. On the other hand, the Central Asian states experienced high levels of unemployment as the number of available workers exceeded the job opportunities. As a result, the migration corridor between Central Asia and Russia began to emerge and develop.

It is important to note that this migration corridor did not solely emerge after the dissolution of the USSR. The same dynamics existed during the Soviet era, and the Soviet government addressed them through an internal migration process.

In this section, I will delve into the migration process from Kyrgyzstan, Tajikistan, and Uzbekistan, as well as the flow of remittances from these countries to the Russian Federation. The data regarding migration stock is based on bilateral migration estimates provided by the United Nations Population Division, while remittance information is calculated by the World Bank through bank transfers.

Migration and remittances have significant implications in Central Asia, shaping the economic and social dynamics of the region. Here are some noteworthy trends observed in migration and remittances in Central Asia, supported by relevant statistics:

Outward Migration: Central Asia has witnessed substantial outflows of individuals seeking better economic prospects outside their home countries. Factors such as high unemployment rates, limited job opportunities, and economic disparities within the region contribute to this trend. For example, a study by the International Organization for Migration (IOM) reveals that Tajikistan and Kyrgyzstan, two Central Asian countries, have some of the highest emigration rates globally.

Remittance Inflows: Remittances serve as a vital source of income for households in Central Asia. Migrants working abroad send money back home, bolstering the economies of their home countries. According to the World Bank, in 2020, remittances to Central Asia amounted to approximately \$31 billion, with the region receiving the highest remittance inflows

as a percentage of GDP globally. This emphasizes the significant role of remittances in supporting livelihoods and economic development in Central Asia.

Dependence on Russia: Russia remains the primary destination for migrants from Central Asia, particularly from Tajikistan, Kyrgyzstan, and Uzbekistan. The Russian economy heavily relies on migrant labor from these countries, especially in sectors like construction, agriculture, and services. Reports indicate that approximately 2.7 million Central Asian migrants were residing in Russia in 2020, contributing both economically and socially to both the host country and their home countries.

Impact of COVID-19: The COVID-19 pandemic has had a profound impact on migration and remittances in Central Asia. Travel restrictions, lockdown measures, and economic downturns disrupted migration flows and remittance inflows. The World Bank estimates a decline of 27.5% in remittance inflows to Central Asia in 2020, reflecting the pandemic's adverse effects on the region's economies and households' incomes.

Digitalization of Remittances: Digital solutions have gained momentum in the remittance landscape of Central Asia. Mobile banking, online platforms, and mobile money services offer convenient and cost-effective channels for transferring remittances. For instance, in Uzbekistan, the use of digital channels for remittances increased by 52% in 2020, highlighting the growing adoption of digital technologies in facilitating remittance transfers.

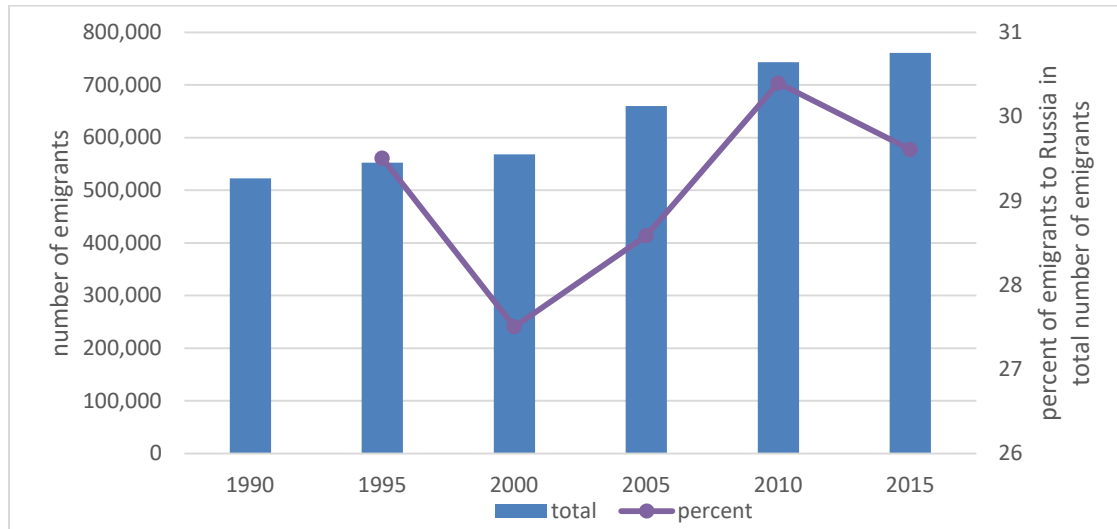
Understanding these trends and statistics related to migration and remittances is essential for policymakers in Central Asia to formulate effective strategies. This includes initiatives focused on improving employment opportunities, reducing barriers to labor mobility, enhancing social integration, and promoting the use of digital platforms to facilitate secure and efficient remittance transfers.

The analysis of migration trends in the Central Asian countries is constrained by the limited availability of data, as information is only accessible up to 2015.

Kyrgyzstan

Migration plays a vital role in the economy of Kyrgyzstan, serving as a means to address unemployment and poverty among the population. From 1990 to 2015, the number of individuals working abroad steadily increased, aligning closely with the growth rate of the economically active population. Consequently, the proportion of emigrants within the labor force remained relatively stable, ranging between 27 and 30 percent of the total (refer to Figure 1). Statistical data reveals that the majority of migrants, approximately 78-82 percent, choose Russia as their preferred destination, while Kazakhstan ranks as the second-largest recipient country.

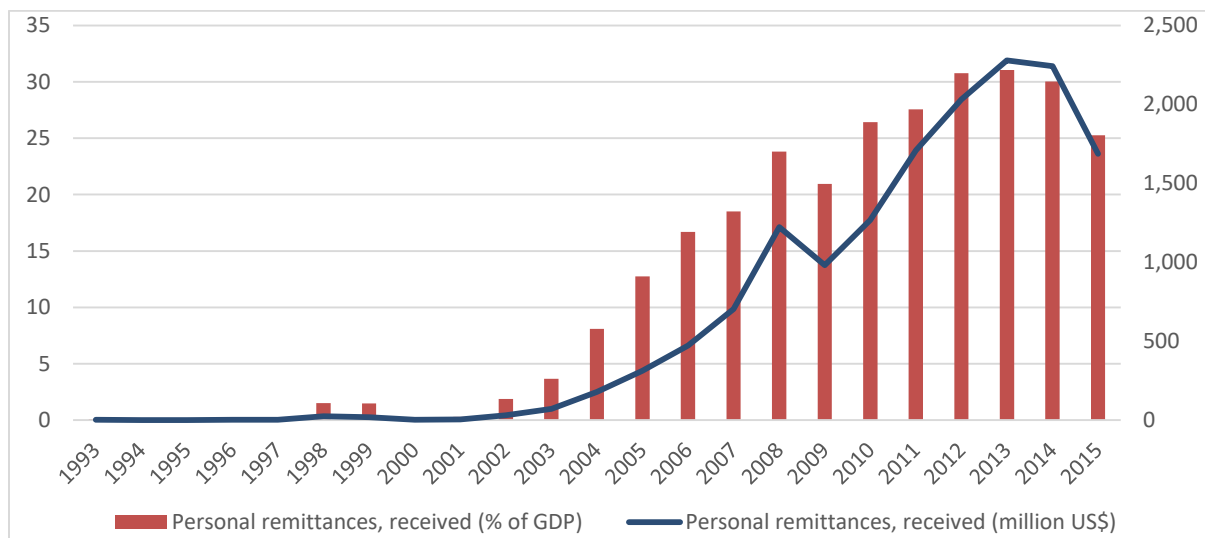
Figure 1. Number of migrants from Kyrgyzstan and their share of the total labor force, 1990-2015



Source: World Bank statistics

During the initial years of independence, migrants from Kyrgyzstan earned relatively low incomes, leading to a limited utilization of bank transfer services for sending money back home. Consequently, it becomes challenging to ascertain the exact amount of money that was remitted to Kyrgyzstan during that period. The lack of transparency in statistics and the absence of tracking mechanisms for remittances by international organizations further contribute to this difficulty. It is important to note that this situation applies not only to Kyrgyzstan but also to all Central Asian countries.

Figure 2. The amount of remittances received and their share of Kyrgyzstan's GDP between 2006 and 2015



Source: World Bank statistics

Based on data from the World Bank, prior to 2002, remittances in Kyrgyzstan constituted less than one percent of the country's GDP, and this proportion remained relatively stable. However, a significant shift occurred thereafter, with remittances experiencing rapid growth. Currently, remittances make up approximately 30 percent of Kyrgyzstan's GDP, amounting to around US\$1.7 billion (refer to Figure 2). The majority of these remittances originate from the Russian Federation, accounting for 77-80 percent of the total. This sheds light on the reason behind the decline in the amount of remittances, as well as their share of the GDP, during the global financial crisis.

Migration and remittances have a significant impact on the economic and social dynamics of Kyrgyzstan. Here are the key trends observed in migration and remittances in Kyrgyzstan, supported by relevant statistics:

Outward Migration: Kyrgyzstan experiences substantial emigration as individuals seek better economic prospects abroad. Russia remains the primary destination for Kyrgyz migrants, followed by Kazakhstan and Turkey. According to the National Statistical Committee of Kyrgyzstan, the number of Kyrgyz citizens working abroad reached approximately 741,000 in 2020, indicating the scale of outward migration.

Remittance Inflows: Remittances play a vital role in Kyrgyzstan's economy, contributing to household income and poverty reduction. In 2020, remittances to Kyrgyzstan amounted to approximately \$2.5 billion, equivalent to around 32% of the country's GDP, as reported by the World Bank. This highlights the significant impact of remittances in supporting consumption, investment, and overall economic development.

Dependence on Russia: The Russian labor market plays a crucial role in the migration dynamics of Kyrgyzstan. Remittances from Kyrgyz migrants working in Russia contribute significantly to the country's economy. In 2020, remittances from Russia accounted for approximately 84% of the total remittances received by Kyrgyzstan, according to the National Bank of the Kyrgyz Republic. This heavy reliance on Russia underscores the vulnerability of Kyrgyz migrants to economic fluctuations in the host country.

Labor Migration Policies: The Kyrgyz government has implemented various policies to regulate labor migration and protect the rights of its citizens working abroad. The establishment of migration offices and centers aims to facilitate legal employment and provide support services to migrants. Bilateral agreements with destination countries, particularly Russia and Kazakhstan, prioritize the welfare and rights of Kyrgyz migrant workers.

Impact of COVID-19: The COVID-19 pandemic has had a significant impact on migration and remittances in Kyrgyzstan. Travel restrictions, lockdown measures, and economic disruptions have disrupted migration flows and remittance inflows. In 2020, remittances to

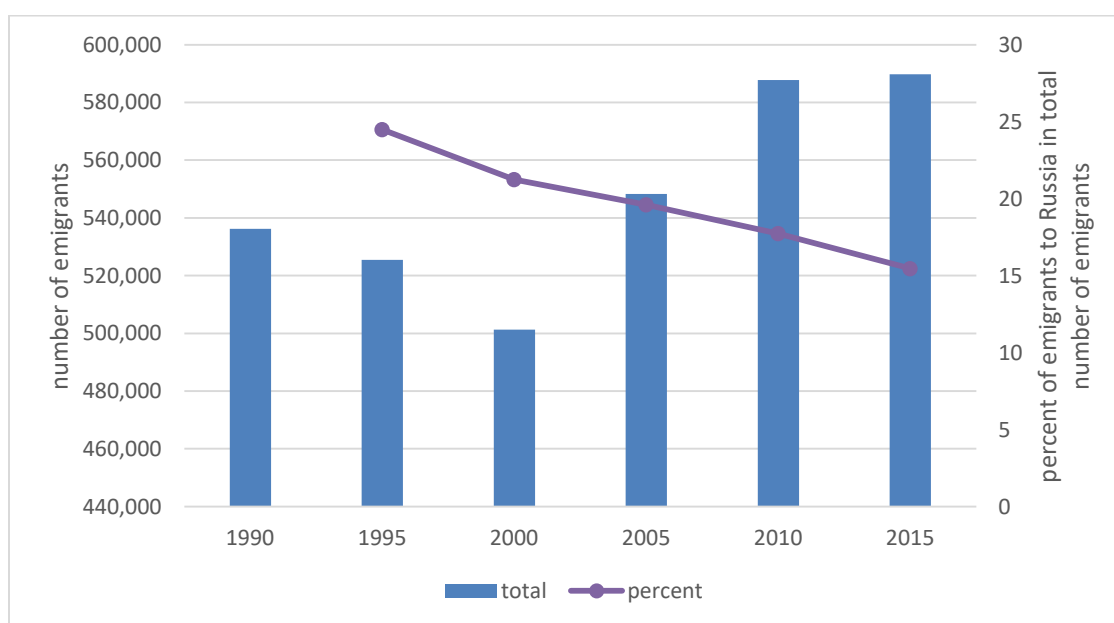
Kyrgyzstan experienced a contraction of approximately 14%, reflecting the challenges faced by Kyrgyz migrants and their families due to the pandemic, as reported by the World Bank.

Understanding these trends and the associated statistics related to migration and remittances is crucial for policymakers in Kyrgyzstan. Efforts should focus on diversifying the economy, creating job opportunities domestically, and implementing measures to protect the welfare and rights of migrants. Building resilience to external shocks, such as the COVID-19 pandemic, is essential to mitigate the adverse impact on remittance flows and household incomes in Kyrgyzstan.

Tajikistan

Tajikistan, being the poorest country in the region, faces challenges such as inadequate economic infrastructure and a low standard of living. These factors drive a significant portion of the economically active population to seek employment opportunities abroad. The country's development was severely hampered by the civil war that took place from 1992 to 1997, leading some Tajikistanis to rely solely on working abroad, particularly in Russia, as their means of livelihood. The number of emigrants initially declined between 1990 and 2000 but began to increase again, reaching 587,000 in 2015 (refer to Figure 3). During the period from 1995 to 2015, between 15 and 25 percent of the economically active population in Tajikistan worked abroad, with 77-80 percent of them finding employment in the Russian Federation.

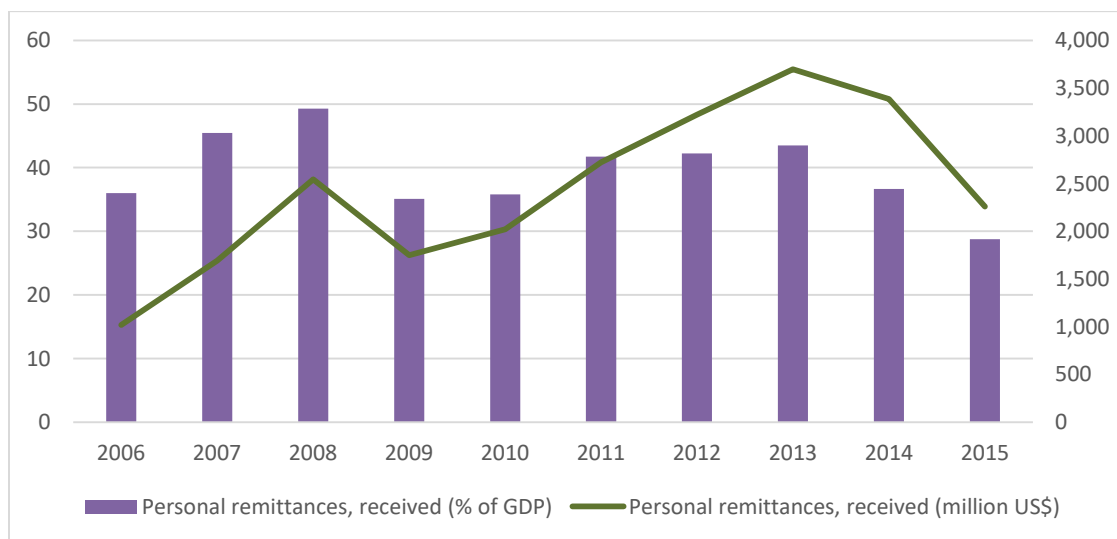
Figure 3. Number of migrants from Tajikistan and their share of the total labor force, 1990–2015



Source: World Bank statistics

To comprehensively analyze the Tajikistani economy's reliance on remittances, it is crucial to examine remittances as a proportion of the country's GDP. Except for the post-2014 period, both the value of remittances and their share of the GDP have shown an upward trend (refer to Figure 4). The peak level of dependence occurred in 2008 when remittances accounted for 49.3 percent of the GDP. Since then, the level of dependence has been gradually decreasing, reaching 28.8 percent in 2015. The substantial reliance on remittances has led many analysts to recommend that the Tajikistani government prioritize the development of domestic infrastructure and diversify the economy by creating new employment opportunities. In fact, some scholars have even cautioned about the potential risks associated with a "migration Dutch disease" in Tajikistan.

Figure 4. The amount of remittances received and their share of Tajikistan's GDP, 2002–2015



Source: World Bank statistics

Migration and remittances have significant implications for Tajikistan, shaping its economic and social landscape. Here are the key trends observed in migration and remittances in Tajikistan, supported by relevant statistics:

Outward Migration: Tajikistan experiences substantial emigration as individuals seek better economic opportunities abroad. Russia remains the primary destination for Tajik migrants, with an estimated 1.1 million Tajik citizens working there in 2020, according to the International Organization for Migration (IOM). This high emigration rate reflects the economic motivations of Tajik nationals in search of employment and higher wages outside their home country.

Remittance Inflows: Remittances constitute a crucial pillar of Tajikistan's economy, providing a significant source of income for many households. In 2020, remittances to Tajikistan amounted

to approximately \$2.8 billion, accounting for around 29% of the country's GDP, according to the World Bank. This substantial inflow of remittances plays a vital role in poverty reduction, household consumption, and overall economic development in Tajikistan.

Dependence on Russia: Tajikistan's economy heavily relies on remittances from its citizens working in Russia. In 2020, remittances from Russia accounted for approximately 85% of the total remittances received by Tajikistan, as reported by the Central Bank of Tajikistan. This heavy dependence on the Russian labor market exposes Tajik migrants to the economic conditions and challenges of the host country, making them vulnerable to fluctuations in the Russian economy.

Labor Migration Policies: The Tajik government has implemented various policies to regulate labor migration and protect the rights of its citizens working abroad. These measures include the establishment of the State Committee on Investments and State Property Management to oversee labor migration issues. Bilateral agreements with destination countries, particularly Russia, aim to ensure the well-being and rights of Tajik migrant workers.

Impact of COVID-19: The COVID-19 pandemic has had a significant impact on migration and remittances in Tajikistan. The closure of borders, travel restrictions, and economic disruptions have severely affected migration flows and remittance inflows. In 2020, remittances to Tajikistan experienced a contraction of about 12%, reflecting the challenges faced by Tajik migrants and their families due to the pandemic, according to the World Bank.

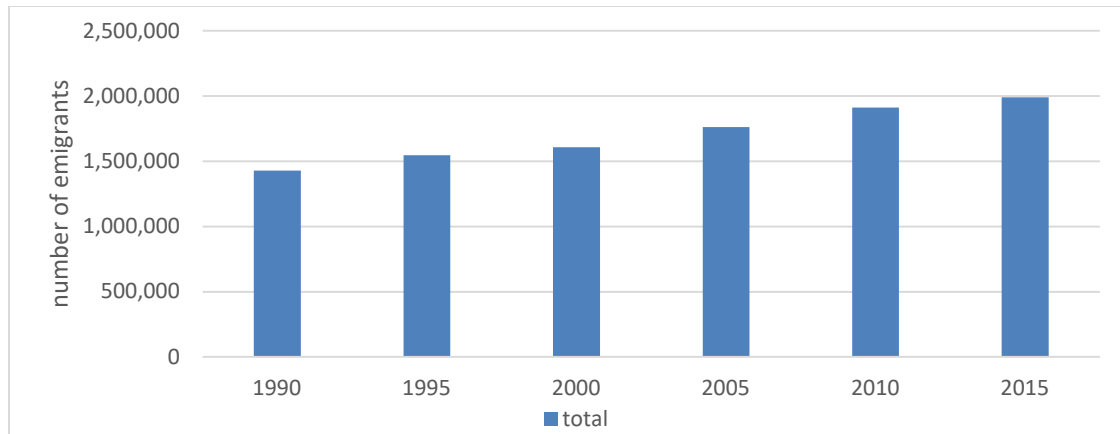
Understanding these trends and the associated statistics related to migration and remittances is crucial for Tajikistan's policymakers. Efforts should focus on diversifying the economy, creating domestic job opportunities, and implementing measures to protect the welfare and rights of migrants. Furthermore, building resilience in the face of external shocks, such as the COVID-19 pandemic, is essential to mitigate the adverse impact on remittance flows and household incomes in Tajikistan.

Uzbekistan

Uzbekistan, with a population of approximately 32 million, is widely recognized for its significant economic potential. Despite having a higher GDP growth rate compared to its neighboring countries, Uzbekistan still grapples with various challenges, including unemployment, weak economic and legal infrastructure, corruption, and a deficient banking system. The average income levels are typically inadequate to meet the cost of living, compelling even individuals with higher education to seek employment abroad, often in construction, retail, and other manual labor occupations. Similar to other nations, the number of migrants from Uzbekistan has increased from 1.4 million in 1990 to approximately 2 million in

2015 (refer to Figure 5). Notably, around 60 percent of all emigrants find work in Russia, and Uzbekistani nationals constitute a significant portion, ranging from 5 to 11 percent, of Russia's migrant population.

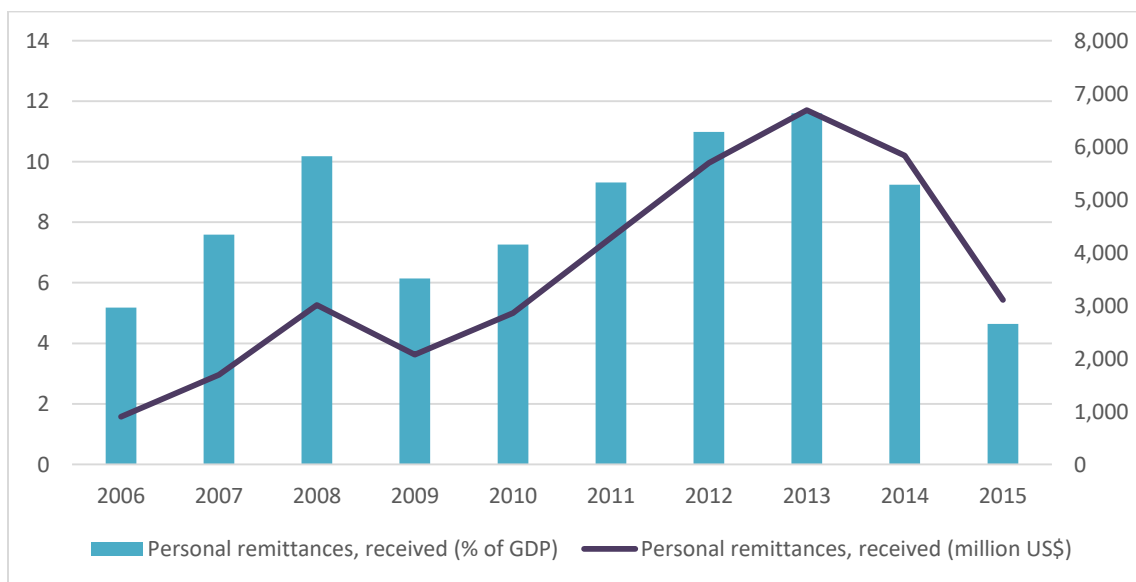
Figure 5. Number of migrants from Uzbekistan and their share of the total labor force, 1990–2015



Source: World Bank statistics

According to Figure 6, remittances from Uzbekistan have shown a consistent upward trend, with the exception of the global financial crisis and the period of sanctions against Russia. The peak of remittances was recorded in 2013, reaching a value of US\$6.7 billion. However, following the imposition of sanctions, remittances began to decline. The fluctuations in remittance inflows highlight the impact of external factors on the remittance flow to Uzbekistan.

Figure 6. The amount of remittances received and their share of Uzbekistan's GDP, 2006–2015



Source: World Bank statistics

As mentioned earlier, the primary destination for migrants from Central Asia is the Russian Federation. However, Kazakhstan also has the potential to become an important recipient of migrants from neighboring countries. Kyrgyzstan and Tajikistan are particularly dependent on remittances, as migration serves as a major solution to address unemployment and poverty in these nations. In contrast, while Uzbekistan's labor market relies on migrants, the country's economy would not face a macroeconomic crisis in the absence of remittances.

Migration and remittances have significant implications for Uzbekistan, influencing its economic and social landscape. Here are the key trends observed in migration and remittances in Uzbekistan, supported by relevant statistics:

Outward Migration: Uzbekistan experiences significant emigration as individuals seek better economic prospects abroad. The main destinations for Uzbek migrants include Russia, Kazakhstan, South Korea, Turkey, and the United Arab Emirates. Economic factors, such as higher wages and employment opportunities, drive this trend. According to the State Statistics Committee of Uzbekistan, around 4 million Uzbek citizens were working abroad in 2020.

Remittance Inflows: Remittances play a vital role in Uzbekistan's economy, contributing to household income and overall development. In 2020, remittances to Uzbekistan amounted to approximately \$6.3 billion, accounting for around 9% of the country's GDP, according to the World Bank. This underscores the significant impact of remittances in supporting consumption, poverty reduction, and investment in Uzbekistan.

Labor Migration Policies: Uzbekistan has implemented policies to facilitate and regulate labor migration. The establishment of the Agency for External Labor Migration aims to protect the rights and welfare of Uzbek migrant workers. Bilateral agreements with destination countries provide a framework for cooperation in ensuring fair treatment and proper working conditions for Uzbek migrants.

Return Migration and Reintegration: In recent years, there has been a noticeable trend of return migration among Uzbek migrants. Many individuals choose to return to Uzbekistan to seize improving economic opportunities and contribute to the country's development. The government has initiated programs to support the reintegration of returning migrants, offering various forms of assistance, including job placement services, business support, and skills training.

Digitalization of Remittances: Uzbekistan has seen an increasing adoption of digital platforms for remittance transfers. Mobile banking and online remittance services have gained popularity among Uzbek migrants, providing convenient, secure, and cost-effective means of sending money back home. The Central Bank of Uzbekistan reported that digital remittances accounted for around 20% of total remittances in 2020, indicating the growing importance of digital channels.

These trends and statistics demonstrate the evolving dynamics of migration and remittances in Uzbekistan. The government's efforts to facilitate labor migration, protect migrant rights, and support return migration contribute to harnessing the benefits of migration for the country's development. Furthermore, the increasing use of digital platforms enhances financial inclusion and efficiency in remittance transfers, benefiting both migrants and their families in Uzbekistan.

The following sections will delve into the extent of economic dependence on migration in Kyrgyzstan, Tajikistan, and Uzbekistan, and explore whether an emigration trap exists in these countries.

METHODOLOGY

In order to assess whether these countries are trapped in a cycle of emigration, it is necessary to establish an objective measure of their dependence on migration. Existing literature often uses remittances as a percentage of GDP as a proxy for a country's reliance on remittances. However, this measure focuses solely on income and fails to consider the labor force aspect. It is important to have an indicator that takes into account the impact on both income and the labor force when recipient countries experience a decline in immigrants or implement new immigration restrictions. These changes can have ripple effects on the macroeconomic situation of donor countries.

This paper suggests a methodology for calculating the level of dependence on migration, which involves the following steps:

$$DLE = \sqrt{Rem_{share} * Emig_{share}}$$

Where

DLE is a country's level of dependence on emigration (%);

Rem_{share} is the share of the official GDP comprised of remittances (%); and

Emig_{share} is the share of emigrant workers in the economically active population.

The geometric mean is employed instead of the arithmetic mean in order to mitigate the level of substitutability between sub-indicators. This approach ensures that a one-percent decrease in the first sub-indicator has an equal impact on the DLE as a one-percent decrease in the other sub-indicator. By using the geometric mean, the weighting of the sub-indicators is balanced, promoting a more comprehensive assessment of a country's dependence on emigration.

The index presented above assesses the overall dependence of an economy on emigration. However, it is important to consider the concentration of emigration flows, as a high concentration poses greater risks to the macroeconomic situation of a country. To capture this

concentration, the paper proposes the use of a market concentration index. Among various options, the Herfindahl-Hirschman Index (HHI) is chosen as the most convenient and effective indicator due to its ease of computation.

$$DLE_{concentration} = \sqrt{Rem_{share} * HHI_{rem} * Emig_{share} * HHI_{emig}}$$

Where

$$HHI_{rem} = \sum_{i=1}^N s_i^2$$

$$HHI_{emig} = \sum_{i=1}^N g_i^2$$

Where

s_i is remittances from country i as a share of total remittances;

g_i is emigrant workers in country i as a share of emigrants from the donor country; and

N is the number of countries where emigrants from the donor country work.

The indicators mentioned above focus on assessing the overall level of dependence of a country. However, this paper aims to specifically analyze the impact of migration policies in recipient countries with a high number of migrant workers on the economic dependence of donor countries. To address this, the following estimate is utilized:

$$DLE_i = \sqrt{Rem_{share} * Rem_{share}_i * Emig_{share} * Emig_{share}_i}$$

Where

DLE_i is the dependence level of the economy on the emigration flow in country i ;

Rem_{share}_i is remittances from country i as a share of total remittances; and

$Emig_{share}_i$ is emigrant workers in country i as a share of total emigrant workers.

The threshold at which countries can be considered to be "in" the emigration trap may vary depending on the country. This threshold can be determined by using econometric models that examine the relationship between the macroeconomic situation and emigration flows. If internal indicators have a greater impact on the macroeconomic situation compared to external indicators related to emigration flows, then the emigration trap is not observed. However, if the economy is significantly influenced by external indicators, indicating a strong dependence on emigration, it may be considered to be in the emigration trap. In general, the model can be summarized by the following equation:

$$Y = DLE_i * \sum_n (\beta_n * X_{external_n}) + \sum_m (\beta_m * X_{internal_m}) + \alpha + \varepsilon$$

Where

Y is the macroeconomic indicator (GDP, unemployment, and exchange rate);

X_n is an explanatory variable;

α and β_n are coefficients of variables; and

ε is the random error of the model.

If $DLE_i * \sum_n(|\beta_n| * X_{external_n}) \geq \sum_m(|\beta_m| * X_{internal_m})$, then there is a high possibility that the economy is in the emigration trap. From this inequality, the limit value of DLE can be calculated:

$$DLE_{limit} = \frac{\sum_m(|\beta_m| * X_{internal_m})}{\sum_n(|\beta_n| * X_{external_n})}$$

In this paper, we aim to model three macroeconomic indicators: GDP, unemployment rate, and exchange rate. We employ three regression models to calculate three threshold values for DLE (dependence on emigration). Among these values, the lowest one is considered the most reliable in determining whether an economy is in the emigration trap.

To estimate the dependence of national economies on the macroeconomic situation in recipient countries, the following formula can be utilized:

$$\begin{aligned} DMSRC &= \frac{DLE_i * \sum_n(|\beta_n| * X_{external_n})}{DLE_i * \sum_n(|\beta_n| * X_{external_n}) + \sum_m(|\beta_m| * X_{internal_m})} = \frac{1}{1 + \frac{\sum_m(|\beta_m| * X_{internal_m})}{DLE_i * \sum_n(|\beta_n| * X_{external_n})}} \\ &= \frac{1}{1 + \frac{DLE_{limit}}{DLE_i}} = \frac{DLE_i}{DLE_i + DLE_{limit}} \end{aligned}$$

If the national economy's dependence on the macroeconomic situation in the recipient country (DMSRC) exceeds 0.5, it indicates a significant possibility that the economy is trapped in the cycle of emigration.

To assess the effectiveness of emigration flows in different countries, the value of remittances per migrant is calculated. This comparison helps identify alternative migration corridors that can reduce concentration in a single economy and mitigate the risks of the migration trap. By studying the underlying causes of migration and understanding its direction, policymakers can develop targeted recommendations and strategies.

Regression Models

As previously discussed, determining the threshold value for an economy's dependence on emigration flows involves using three regression models that analyze the key macroeconomic indicators and patterns of macroeconomic equilibrium. The selection of appropriate variables for these models is crucial in achieving accurate results.

To model the Gross Domestic Product (GDP) indicator, we consider the following variables:

Table 1a. Variable definitions

Variable	Abbreviation	Unit of measurement
Remittance from the Russian Federation	Rem	US\$million
Exchange rate of ruble	Ex_rate_rus	Dollar/ruble
Exchange rate of national currency unit	Ex_rate_nat	Dollar/national currency unit
Net export in Central Asian countries	XN	US\$million
Foreign direct investment	FDI	US\$million

The aforementioned variables are value-creating indicators and exchange rates, which provide insights into the overall macroeconomic situation of the country. It is anticipated that all coefficients associated with these variables would be positive, indicating a positive relationship with GDP. While there might be other variables that could potentially influence GDP, the lack of available data restricts their inclusion in the model.

To model the unemployment rate, we select the following variables:

Table 1b. Variable definitions

Variable	Abbreviation	Unit of measurement
Migrants as a share of the economically active population in the Russian Federation	Emig_share_Rus	%
GDP growth rate	GDP_growth	%
Foreign direct investment as a share of GDP	FDI_share	%

The GDP growth rate is a key indicator that reflects changes in a country's macroeconomic conditions. A thriving macroeconomic situation often results in the creation of new jobs, leading to a decrease in the unemployment rate. When migrants leave their home country to work abroad, they are not counted as part of the unemployed population, contributing to a lower recorded unemployment rate. Additionally, Foreign Direct Investment (FDI) plays a significant role in job creation. If FDI constitutes a substantial portion of the country's GDP, it

can help alleviate unemployment. Therefore, in the regression model for the unemployment rate, the coefficients associated with these variables are expected to be negative.

The exchange rate is the third indicator we consider, and the factors that explain fluctuations in the exchange rate are outlined in the table below:

Table 1c. Variable definitions

Variable	Abbreviation	Unit of measurement
Remittances from the Russian Federation	Rem	US\$billion
Exchange rate of ruble	Ex_rate_rus	US\$
Net exports of Central Asian countries	XN	US\$billion
Inflation rate	Inf	%

Remittances and net exports are the primary sources of foreign currency in Central Asian countries. The inflation rate is affected by the depreciation of national currencies, and the exchange rate of national currencies is influenced by the value of the Russian ruble due to migrants receiving salaries in rubles. We anticipate a positive correlation coefficient between the exchange rate and all variables except for the inflation rate, which is expected to have a negative coefficient.

RESULTS

To assess the level of remittance dependence in countries, we conducted three regression models. In the GDP model, our econometric analysis revealed that among the variables considered, only remittance amounts and foreign direct investment significantly impact GDP. These two indicators play a crucial role in value creation and can effectively describe other economic cycles as well.

In the unemployment rate model, our econometric analysis led us to include the "share of Russian migrants in the total labor force of countries" and the "GDP growth rate" as explanatory variables. The GDP growth rate helps us understand the functioning of the economy and whether it is generating new job opportunities. Emigration serves as a primary mechanism to address unemployment in these countries.

In the exchange rate model, we made adjustments by excluding the inflation rate and the ruble exchange rate, and instead incorporated the variables "remittances from Russia" and "net exports" to address issues of multicollinearity and endogeneity. These modifications resulted in more optimal models.

In the case of the GDP model, the coefficient of determination exceeds 70 percent for all three countries, indicating a strong relationship between the included variables. However, for the unemployment rate and exchange rate models, the coefficient of determination does not surpass 40 percent. This can be attributed to the presence of omitted variables and limited data availability. Now, let's delve into the specific results of these models for Kyrgyzstan, Tajikistan, and Uzbekistan.

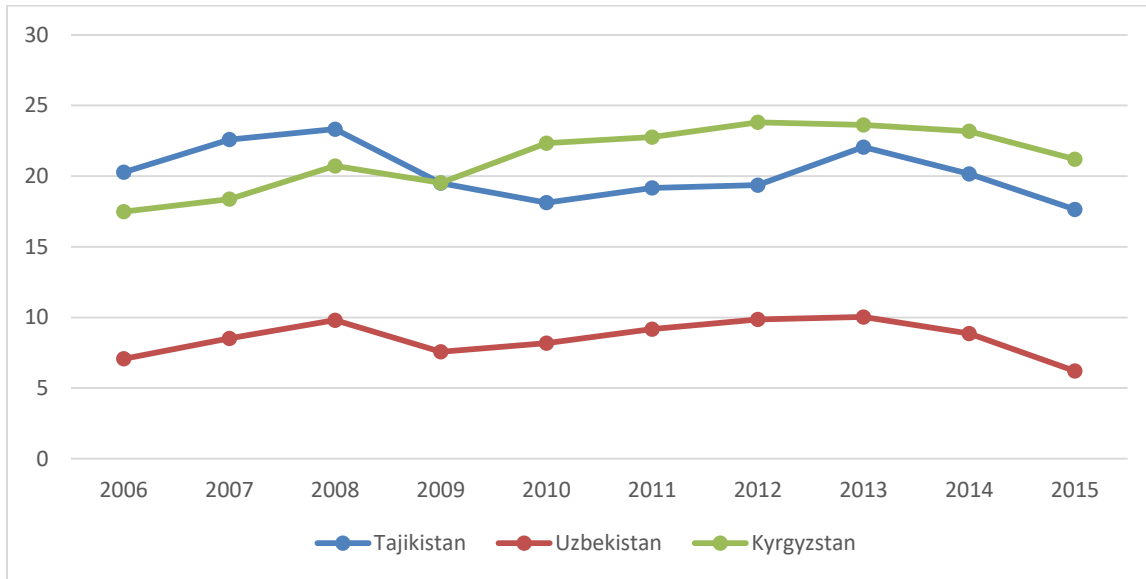
Table 2. Regression results

	Kyrgyzstan	Tajikistan	Uzbekistan
GDP			
Rem	9.8901***	9.2693***	56.475***
FDI	1.1956***	0.3876*	9.2599*
const	1705.988***	1521.029**	16588.07*
R square	0.9576	0.8368	0.5027
Unemployment			
Emig_share_Rus	-0.0889*	-0.1043*	-0.0029*
GDP_growth	-0.0138*	-0.0649*	-0.0704*
R square	0.1571	0.1895	0.2022
Exchange rate			
Rem	0.00004*	0.0072*	1,02E-07*
XN	0.00002*	0.0019**	6,15E-08*
R square	0.2745	0.6972	0.5685

In certain cases, the models exhibit low coefficients of determination, indicating a limited ability to explain the variability in the data. Additionally, there are significant coefficients in some models that have a low level of confidence, suggesting a higher degree of uncertainty in their reliability.

Using the regression coefficients and the methodology described earlier, the limit values of dependence on migration were calculated and compared to the actual values of this indicator. In Kyrgyzstan and Tajikistan, the limit values have remained around 0.15 since 2016, while the dependence of their national economies on the macroeconomic situation in recipient countries has been higher than 0.55. On the other hand, Uzbekistan has a limit value of approximately 0.3. When comparing the real values to the limit values, it can be observed that Kyrgyzstan and Tajikistan have been trapped in the cycle of emigration since 2006, while Uzbekistan does not exhibit a high level of dependence on external factors. Figure 7 provides a visual representation of the percentage of emigration dependence experienced by these three countries.

Figure 7. Tajikistan, Uzbekistan, and Kyrgyzstan: levels of emigration dependence, 2006–2015



Tajikistan and Kyrgyzstan exhibit significant levels of migration dependence, suggesting the possibility of being trapped in the cycle of emigration. On the other hand, Uzbekistan demonstrates a lower level of migration dependence, less than 10 percent, indicating that its economy is not heavily reliant on remittances and migration. It is important to note that the reliability of this conclusion is limited due to insufficient data and the author's calculation of certain omitted indicators. A more confident assessment of the hypothesis could be achieved with the availability of quarterly or monthly data provided by national or international organizations.

Digitalization and migration

Digitalization offers a range of opportunities to tackle migration challenges in Central Asian countries by leveraging its transformative impact on different aspects of the migration process. Analyzing relevant statistics and data highlights the potential benefits of digitalization in overcoming migration problems:

Access to Information and Services: Digital platforms and online resources provide migrants in Central Asian countries with valuable information on migration policies, legal procedures, employment opportunities, and social services in destination countries. For instance, a study conducted by the International Organization for Migration (IOM) found that 70% of migrants in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan have access to the internet, enabling them to seek information on migration-related matters.

Communication and Connectivity: Digital tools such as social media, messaging apps, and video conferencing facilitate communication and connectivity for Central Asian migrants, allowing them to maintain relationships with their families, communities, and support networks. According to the Central Asia Regional Migration Program (CARMP), approximately 80% of migrants from Central Asian countries use digital communication channels to stay connected with their loved ones.

Remittances and Financial Inclusion: Digital financial services have made remittance transfers more accessible, cost-effective, and secure for migrants in Central Asian countries. The World Bank estimates that in 2019, remittances to Central Asia accounted for over 8% of the region's GDP, totaling approximately \$17 billion. The use of digital platforms for remittances has grown significantly, with reports indicating that mobile money transfers in Central Asia increased by 140% between 2017 and 2020.

Data Collection and Policy Development: Digitalization enables more accurate data collection and analysis, aiding evidence-based policymaking in Central Asian countries. Digital platforms, mobile applications, and data analytics contribute to real-time monitoring of migration patterns, labor market demands, and integration outcomes. This information empowers policymakers to design and implement targeted migration policies. For instance, the Central Asia Migration Response Center (CAMRC) actively utilizes digital tools to collect and analyze migration data for evidence-based policy development.

While specific statistics on the impact of digitalization on migration challenges in Central Asian countries might be limited, available data indicates the positive influence of digital technologies. For instance, according to the World Bank, digital remittance transfers to Central Asia have shown resilience during the COVID-19 pandemic, with a 20% increase in digital transactions recorded in the first quarter of 2021.

To fully harness the potential of digitalization, it is crucial to ensure equitable access to digital technologies, protect data privacy, and address any potential risks or vulnerabilities associated with digital platforms in Central Asian countries.

CONCLUSION

Based on the results of econometric models and data analysis, it is evident that Tajikistan and Kyrgyzstan are sufficiently dependent on migration to be classified as being in the emigration trap. These countries exhibit higher values of the migration dependence indicator than their respective limit values, indicating that their macroeconomic situations are influenced by external factors such as remittances and the macroeconomic conditions of recipient countries. Remittances play a crucial role in addressing various macroeconomic challenges,

including unemployment and poverty, in both countries. However, this heavy reliance on a single recipient country, namely Russia, exposes them to the risk of macroeconomic crises if Russia imposes immigration restrictions.

To reduce this dependence, it is crucial for Kyrgyzstan and Tajikistan to invest in economic infrastructure and create more employment opportunities within their domestic markets. Research conducted by Thagunna and Acharya on remittances in Nepal suggests that financing economic infrastructure and promoting domestic job creation are effective strategies for overcoming economic dependence on migration. Additionally, exploring alternative migration destinations can help mitigate the impact of the emigration trap, diversifying the countries' reliance on a single economy like Russia. To provide more specific recommendations, a deeper analysis of migration drivers, vulnerable sectors, barriers to effective economic reforms, and key macroeconomic challenges in Central Asian countries would be necessary.

In conclusion, embracing digitalization in Central Asia has the potential to reduce the region's dependency on migration. By investing in digital skills and education, fostering digital entrepreneurship, facilitating e-commerce and digital trade, enhancing digital government services, promoting remote work and freelancing, strengthening digital infrastructure, and encouraging collaboration and partnerships, Central Asian countries can create new opportunities and address the underlying issues that drive migration. While digitalization alone cannot solve all challenges, it can contribute significantly to sustainable development, economic growth, and a more prosperous future for the region.

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