

TAJIKISTAN

POVERTY AND EQUITY ASSESSMENT TRANSFORMATION AT HOME

SEPTEMBER 2025



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POVERTY AND EQUITY ASSESSMENT

TRANSFORMATION AT HOME

September 2025

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Acknowledgements

The Poverty and Equity Assessment for Tajikistan was produced by a core World Bank team led by **Alisher Rajabov** (Senior Economist) and **Chiyu Niu** (Economist).

The core team includes: **Obert Pimhidzai**, **Wondimagegn Mesfin Tesfaye**, **Jin Yao**, **Sinafikeh Asrat Gemessa**, **Na Zhang**, **Tawanda Chingozha**, **Xuejiao Xu**, **Zuhro Qurbonova** and **Hongxi Zhao**.

The report was prepared under the leadership and guidance of **Tatiana Proskuryakova** (Regional Director for Central Asia), **Luis-Felipe Lopez-Calva** (Global Director for Poverty and Equity Global Department), **Asad Alam** (Prosperity Regional Director for Europe and Central Asia), **Ambar Narayan** (Poverty and Equity Global Department Manager for Europe and Central Asia), and **Ozan Sevimli** (Country Manager for Tajikistan). The team is also grateful to the following Program Leaders: **David Stephen Knight** (Prosperity), **Tazeen Fasih** (People), and **Urvashi Narain** (Planet).

The team benefitted greatly from detailed comments and suggestions from the following Peer Reviewers: **Javier Baez**, **Sailesh Tiwari**, **Nobuo Yoshida**, **Gohar Gyulumyan**, **Aziz Atamanov**, **Ikuko Uochi**, **Sergio Olivieri**, **Bakhrom Ziyaev**, **Elizabeth Mary Foster**, **Aly Sanoh** and **Veronica Montalva**.

Special thanks to the following colleagues in the World Bank Tajikistan Country Team for their invaluable advice and feedback during consultations: **Ilyas Sarsenov**, **Faridun Sanginov**, **Tigran Smis**, **Farzona Mukhitdinova**, **Hazem Ibrahim Hanbal**, **Marufqul Mahkamov** and **Francisco Moraes Leitao Campos**.

Project management support was provided by **Shahlo Norova**, **Fatkhiya Khamidova**, **Rakhymzhan Assangazyev**, **Shoira Zukhurova**, **Essien Conelly**, **Igor Kecman**, **Dilafruz Zoirova**, **Jahona Akbarova**, **Kubat Sydykov** and **Vladimir Mirzoyev** prepared this report for publication.

The team is grateful to the Ministry of Economic Development and Trade, Agency for Statistics, Ministry of Finance, Ministry of Education and Sciences, Ministry of Labor, Migration, and Employment, Committee for Environmental Protection under the Government of the Republic of Tajikistan, Council for Middle-Class Expansion and numerous government agencies for their invaluable feedback and inputs during the preparation of the report.

This report was prepared with financial support from the Effective Governance for Economic Development in Central Asia Program ([EGED](#)), funded by the UK Government. However, the views expressed herein do not necessarily reflect the official policies of the United Kingdom.

Executive Summary

Tajikistan has made remarkable progress in reducing poverty over the past decade. The national poverty rate declined from 56 percent in 2010 to just below 20 percent in 2024 — an impressive achievement by regional and global standards. Over the same period, the share of population classified as middle class grew from 8 percent to 33 percent, reflecting significant gains in household welfare. Upward mobility was significant, with 35 percent of households moving up the economic ladder between 2021 and 2023, primarily into the middle class. This aligns with the nation's ambition to expand its middle class, as outlined in the National Development Strategy 2030, which aims to increase the middle class to 50 percent of the population and reduce poverty to below 10 percent by 2030.

However, recent success has been attributed more to wage growth in existing jobs and external factors beyond Tajikistan's borders rather than domestic job creation. Both job creation and within-job income growth can reduce poverty. A long-term subnational analysis (2010-2022) shows that structural transformation – shifting workers from low-productivity agriculture to higher-productivity sectors – is more effective at reducing poverty and growing the middle class than wage growth alone. However, recent analysis of survey from 2021 to 2022 reveals that within-job income growth accounted for 73 percent of poverty reduction, but when looking closely, all of this came from rising average incomes within sectors, with little changes in the sources of incomes of households across sectors. Private consumption driven by remittances and increasing labor incomes, particularly in the agriculture and low-skill services sectors, have been pivotal. Additionally, middle-class growth and economic mobility have been significantly influenced by labor income from non-agricultural sectors, including services and industry, as well as private transfers resulting from migration. From 2021 to 2022, remittances contributed to 39 percent of poverty reduction and facilitated 24 percent of middle-class expansion.

Indeed, Tajikistan's domestic labor market has failed to generate enough jobs despite its high economic growth. Economic growth, averaging 7 percent per year in 2013-23, has not been accompanied by commensurate job creation with a growth elasticity of employment in Tajikistan was just 0.2. Growth has been concentrated in capital-intensive sectors rather than labor-intensive ones. Industrial value-added expanded by 6.7 percent from 2013 to 2023, while employment grew by just 0.4 percent, indicating capital-intensive growth. Meanwhile, the labor-intensive service subsectors' output declined, while employing the same number of people. Agriculture still employs 60 percent of the workers despite only accounting for a quarter of GDP, signifying how labor has failed to move out of the sector. Furthermore, productivity gains in agriculture have been slow, and opportunities for upward mobility remain limited.

This slow and fragmented domestic structural transformation could hinder Tajikistan's ability to further develop a strong middle class. While regions that have diversified their economies have seen middle-class expansion, most rural areas with deep pockets of poverty—particularly Khatlon, which accounts for half of the nation's poor—remain reliant on low-productivity agriculture and remittance-dependent incomes. This could limit broader economic mobility in future. Transition analysis shows that households whose heads moved from low-skilled to medium- or high-skilled occupations were significantly more likely to achieve middle-class status, with such progressive transitions increasing middle-class membership by over 13 percentage points between 2021 and 2022. Yet, these occupational transitions remain limited, particularly in

rural areas. At the subnational level, middle-class expansion has been tied to job creation in state-dominated sectors such as mining and hydro resources, where a 1-percentage-point increase in employment corresponds to a 3.5-percentage-point rise in middle-class share. While state-led sectors have previously driven middle-class growth, it is uncertain if they will continue to do so sustainably in the future.

The stagnation in job creation is associated with a structural bias toward state-owned enterprises (SOE) and public sector activities. Nearly half of all jobs in 2022 are in SOEs or government sectors. In contrast, sectors where private enterprises dominate employment – such as labor-intensive services (72 percent private) and construction (84 percent private) – have experienced either declining value added or minimal growth in recent years. Labor-intensive services like retail, wholesale, and transportation saw a 10.9 percent decrease in value-added share from 2013 to 2023, with employment share increasing by 0.4 percent. Skill-intensive services such as education and health, primarily dominated by state-owned enterprises (SOEs) and public sectors, have seen minimal growth with a 1.1 percent decline in value-added share, while the employment share increased by 2.3 percent. Consequently, the distribution of activities has favored SOEs and public sectors over the private sector, which typically has a higher job creation potential.

In the absence of local opportunities, labor migration and remittances have shaped the economic and social fabric of Tajikistan. Remittances accounted for over 30 percent of GDP in recent years and fueled consumption growth that drove over 80 percent of the GDP growth, but primarily among households (about 36 percent) that already had the means to send migrants abroad. About 11 percent of poor households have a migrant compared to 42 percent of non-poor households. In total, more than a quarter of the Tajik labor force has migrated in search of better opportunities, sending back remittances that have lifted households out of poverty and expanded the middle class.

Yet, this migration-led model is neither sustainable nor equitable, leaving the country vulnerable to external shocks and failing to create enough quality jobs at home to sustain long-term, inclusive growth. While remittances reduced poverty by 43 percent, poorer families who can't afford migration have been left behind, increasing income gaps. The result is a paradox: poverty has fallen, yet inequality has risen, with the Gini coefficient climbing to 38 in 2023 from 32 in 2021. Rural households that receive remittances have surged ahead, while those without access remain trapped in jobs in low-productivity agriculture and informal services. This pattern underscores the limits of migration-led development—it benefits some but leaves structural inequalities intact.

Compounding the challenges of lack of domestic opportunities is Tajikistan's persistently low labor force participation rate, particularly among women. As of 2022, the overall labor force participation rate was only 40 percent of the working-age population – the lowest in Central Asia and among lower middle-income countries. The situation is even more concerning for women: female labor force participation – at 21 percent – is lagging 39 percentage points behind men's. Nearly two-thirds of young women (aged 15-24) are neither in employment, education, nor training (NEET), limiting their economic opportunities and contributing to household vulnerability.

Geography further compounds Tajikistan's inequality, as high-altitude and remote areas face persistent barriers to development. More than 90 percent of the country's land is mountainous, creating significant challenges for infrastructure, market access, and service delivery. Poverty rates exhibit a significant increase with elevation, rising by 10 percentage points for every 500

meters in altitude. Households in these areas are not only poorer but also more isolated, with limited access to education, health care, and digital connectivity. This spatial divide reinforces economic stagnation in rural regions, making it even harder for households to escape poverty through domestic opportunities. Even areas close to urban centers are disconnected. For instance, the poverty rate in the DRS region surrounding Dushanbe is 26 percentage points higher than in the capital – a disparity exacerbated by the region’s mountainous terrain, which creates significant economic distance from the capital.

Climate change deepens these geographic disparities, disproportionately impacting regions already burdened by poverty and limited economic opportunities. Rural areas like Khatlon, DRS, and GBAO – home to 91 percent of Tajikistan’s poor – are highly exposed to climate risks, particularly droughts and floods, which threaten agricultural livelihoods and undermine progress in poverty reduction. In Khatlon, where over half of the country’s poor reside and dependence on low-productivity agriculture is highest, a severe drought could affect up to one-third of districts, with more than 34 percent of their populations impacted. Meanwhile, Sughd faces higher flood risks, which can disrupt livelihoods even in its more populous and economically active areas. Climate shocks not only increase poverty – by up to 1.2 percentage points nationally under pessimistic scenarios by 2035 – but also stall the growth of the middle class, with projections showing nearly half a million fewer people achieving middle-class status by 2040 in the absence of adaptation. These risks are compounded by degraded landscapes, low water productivity compounding the dependence on water intensive crops, and limited access to infrastructure, leaving many rural households vulnerable to repeated shocks and diminishing their chances for upward mobility.

Internal mobility is also very low, constrained not by formal restrictions but by a lack of viable opportunities together with information gaps that limit movement to more productive jobs. Unlike many other developing countries where rural-to-urban migration has driven structural transformation, Tajikistan’s urbanization has remained slow. Urbanization rate increased only 2 percentage points from 27 percent in 2010 to 29 percent in 2023. While workers may want to move, they lack clear pathways to better opportunities, as job availability, housing, and information about urban labor markets remain limited. As a result, migration within the country has been far lower than labor migration abroad, leaving cities underdeveloped and rural areas overly reliant on subsistence agriculture.

Education and skills gaps are preventing many Tajiks from accessing higher-productivity jobs, both at home and abroad. Many students leave the system without the skills needed for modern jobs, contributing to a cycle of low-wage employment. The share of out-of-school children has increased to about 31 percent in 2023, particularly among older students. Dropouts are strongly linked to budget constraints, long distances to schools, and parents’ perceptions and education levels. As a result, human development has lagged the progress in monetary poverty. Low education outcomes account for over 50 percent of multi-dimensional poverty, which has not improved since 2021. Furthermore, differences in education attainment, are the biggest contributor to rising inequality, adding 8 Gini percentage points. This is particularly concerning given that labor markets in the Russian Federation and other destination countries are also evolving, demanding more specialized skills. Without targeted investments in education and workforce training, Tajikistan’s future labor migrants may find themselves at an increasing disadvantage, while those who remain in the country will struggle to secure well-paid jobs.

To sustain progress and create a more resilient, inclusive economy, Tajikistan must transition from migration-driven to domestic-driven job creation. This requires a comprehensive policy shift aimed at expanding economic opportunities, strengthening human capital, reducing spatial inequalities, and strengthening protection of the vulnerable.

The following policy recommendations outline key areas of action:

I. Transformation of agriculture to increase income of the poor and kick start domestic structural transformation.

The region with the highest agriculture potential, Khatlon, accounts for over half of the nation's poor – suggesting untapped potential within the sector that needs to be unlocked to move people out of poverty. Strengthening agriculture will boost rural livelihoods and lay the groundwork for industrialization. Transformation in agriculture has however been hampered by state crop mandates which has increased reliance on water demanding crops exposing the sector to climate shocks. Farmers lack access to technology and information due to unfinanced extension services and the absence of market information systems.

1. Advancing agricultural development by relaxing crop choice mandates, enhance extension services in Khatlon.
2. Increase access to information by modernizing agriculture market information systems and early warning systems.
3. Increase resilience of agriculture by improving irrigation efficiency, and promoting climate-smart technologies.

II. Private sector job creation in labor intensive sectors.

Tajikistan's industrial sector remains heavily state-led and capital-intensive, limiting employment growth. Industrial expansion has favored capital over labor. Less than 15 percent of total industrial value added is allocated to labor wages, with the rest absorbed by capital and other non-labor factors. The dominance of state ownership in the sector – estimated at 70 percent – has further constrained competition and job creation.

4. Tajikistan needs to restructure industrial policies to promote job creation by transition from state-led, capital-intensive industrialization to labor-intensive strategies, particularly in agro-processing industries.
5. Promote competition and reform market entry regulations to develop labor-intensive industries like courier services which can help integrate rural workers into the economy and reduce dependence on remittances.

III. Equalizing access to opportunities for all

Poverty reduction in Tajikistan could have been greater (by 4 more percentage points) if economic growth had been more evenly distributed. There are stark spatial inequalities in access to economic opportunities, particularly across regions. The poorest regions, such as Khatlon and DRS, account for more than 85 percent of the country's poor, highlighting severe regional disparities. The poor live twice as far from education and medical institutions as the non-poor, limiting their ability to acquire the skills needed for better-paying jobs. Rural areas also remain disconnected from the national and global markets due to poor transport infrastructure and digital access, restricting labor mobility and economic participation. With less than 15 percent of households having bank accounts, financial inclusion is low. Addressing these gaps is crucial for fostering inclusive growth and providing all Tajiks with meaningful economic opportunities.

6. Equalizing access to economic opportunities by strengthening education and vocational training in rural areas. Building more schools, providing educational vouchers for low-income households, and investing in adult training programs will help equip workers for better-paying jobs, both domestically and abroad.
7. Improving infrastructure will connect rural areas to national and global markets. Despite Dushanbe and Sughd having low poverty rates, poor transportation limits inter-regional and rural-to-urban migration. The mountainous terrain further restricts access, especially to Sughd. Limited extension services (informed by regional consultations) and the low usage of the internet for productive activities (less than 5 percent) highlight the information and digital divide. Investing in transport and digital infrastructure and creating a labor market information platform will bridge the rural-urban gap and open economic opportunities.
8. Encouraging financial inclusion and entrepreneurship by improving access to credit and supporting small businesses, particularly in rural areas. Expanding microfinance and reducing barriers to business entry will help foster self-employment and local economic growth.

IV. Strengthening protection of the vulnerable

Tajikistan also faces challenges in protecting its most vulnerable populations from economic shocks. Although 45 percent of the poor receive public transfers, the majority of these are pensions, which constitute the lowest rate of all income sources. Non-pension public transfers reach less than 15 percent of the poor households, indicating under-coverage of the Targeted Social Assistance (TSA) program. Insufficient social protection mechanisms expose numerous households to the risk of reverting to poverty during crises, thereby also obstructing their progress towards achieving middle-class status.

9. Expanding coverage of the Targeted Social Assistance program to support vulnerable populations and help them adapt to economic shocks.

Tajikistan stands at a crossroads. The country's poverty reduction achievements are commendable, but the current model — dependent on external migration and remittances — cannot be the foundation for long-term prosperity. To build a stronger, more inclusive economy, Tajikistan must generate jobs at home, reduce geographic and economic barriers to opportunity, and ensure that growth benefits all segments of society. The challenge ahead is not just to sustain poverty reduction but to transform the economy so that prosperity is homegrown, resilient, and shared by all. Our hope is that this Poverty and Equality Assessment can offer pathways to not only continue the trend toward poverty reduction but also to support Tajikistan in structural transformation toward greater and more equitable domestic growth.

Core Analytics of Tajikistan Poverty and Equity Assessment

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Photo: The World Bank Tajikistan Country Office Photo Collection.

Introduction

Prior to independence, Tajikistan's role within the Soviet Union (1928–1991) was primarily that of an agrarian republic supplying cotton (often referred to as “white gold”), minerals, labor migrants, and soldiers. Cotton production was intensively water-consuming and sustained through large-scale irrigation projects initiated by the Soviet government. Tajikistan was also rich in hydropower, which benefited from these irrigation projects. The country's mountainous terrain offered mineral resources such as gold, silver, and uranium, but a lack of infrastructure and industrial capacity limited the potential of the mining industry. Though not seen in the same numbers post-independence, labor migration from Tajikistan to Russia started during Soviet times long before Tajikistan's independence in 1991. Seasonal and permanent labor migrated to more industrialized regions in the Soviet Union. In addition, Tajik soldiers, estimated to number about 260,000, fought in key battles during World War II, such as the Battle of Stalingrad, the Siege of Leningrad, and the liberation of Eastern Europe. In the Cold War period following World War II, Tajikistan remained heavily militarized, particularly during the time of the Soviet-Afghan War (1979–1989).

Since gaining independence, Tajikistan has been charting its own course, shaped by resilience and struggle. The collapse of the Soviet Union and subsequent independence of Tajikistan in September 1991 led to a severe economic downturn. A brutal civil war from 1992 to 1997 further devastated the country's economy, with Tajikistan's GDP shrinking by more than 60 percent compared with its pre-independence levels. Post-civil war recovery began in the late 1990s with agricultural revival, especially in cotton production, alongside remittance inflows from labor migrants to the Russian Federation. Despite this recovery, by the end of the 2000s the economy had merely returned to pre-independence levels, marked by limited industrialization and heavy reliance on remittance inflows. The previous Poverty Assessment covered the growth and poverty stories up to 2009.

This subsequent Core Analytics of Poverty and Equity Assessment (CAPEA) tells the story of Tajikistan's remarkable journey of progress and perseverance over the past decade, and provides policy recommendations for the coming years to meet the country's aspiration of achieving middle-income status by 2030. According to the latest National Development Strategy (NDS), Tajikistan aspires to see 50 percent of its population achieving middle-class status, with less than 10 percent remaining in poverty. From 2010 to 2024, the country achieved a dramatic reduction in poverty, with rates falling from 55 percent to just 19.9 percent. These numbers are testament to Tajikistan's resilience and determination to create a more inclusive and thriving economy. This CAPEA takes a deep dive into this transformation, offering a fresh and comprehensive look at the shifting trends in poverty, its root causes, and the human stories behind the statistics. By bridging critical knowledge gaps since the previous Poverty Assessment in 2009, this CAPEA sheds light on Tajikistan's successes while confronting the challenges that remain.

Data sources for this CAPEA include the official household budget surveys (HBS) and administrative data shared by the National Statistics Office in Tajikistan (Tajstat), as well as the Listening-to-Tajikistan (L2T) surveys conducted by the World Bank. Before undertaking this CAPEA, the World Bank supported the Tajstat in improving the quality of the HBS starting from 2021. These improvements included a modernized questionnaire, an updated sample of 3,000 households that are representative on the national, rural-urban, and provincial levels, and the evolution from a paper-based to a computer-based approach for data collection.

Chapter I.

Poverty Trends and Profiles

Tajikistan has successfully reduced monetary poverty, driven by consumption-fueled growth averaging 7 percent per year. However, poverty remains concentrated in the Khatlon region and the Districts of Republican Subordination (DRS), the country’s most agriculture-dependent provinces. Despite these gains, 31 percent of children were not attending or enrolled in school in 2023. For poor households, schools are often distant and costly, and parents with lower education levels place less value on education. This limited investment in human capital constrains economic growth, restricts equal opportunities, and hampers efforts to expand the middle class.

Poverty and welfare trends

Tajikistan has succeeded in reducing monetary poverty

The national poverty rate declined from over 55 percent in 2010 to just below 20 percent in 2024. The steady decline (Figure 1), averaging 2–3 percentage points annually from 2010 to 2019, accelerated significantly between 2021 and 2023. The extreme poverty rate, measured using a food-based poverty line, has fallen to single digits. Subjective measures of poverty derived from the Listening-to-Tajikistan initiative indicate a similar trend but nonetheless suggest that 45 percent of the population perceive themselves as living in poverty. Based on household-level analysis (Figure 2), the findings reveal growth across the entire consumption distribution. The consumption density function indicates that consumption levels in 2023 were higher than 2010 for everyone, from the poorest to the richest. Despite a delayed economic recovery that only surpassed pre-independence GDP levels in 2014, together with setbacks due to the COVID-19 pandemic in 2020, Tajikistan demonstrated a strong rebound in 2021.

Figure 1. Trends in monetary poverty under the national and extreme poverty lines

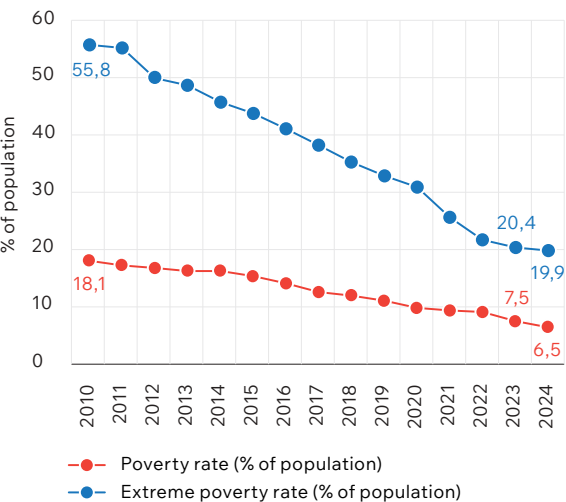
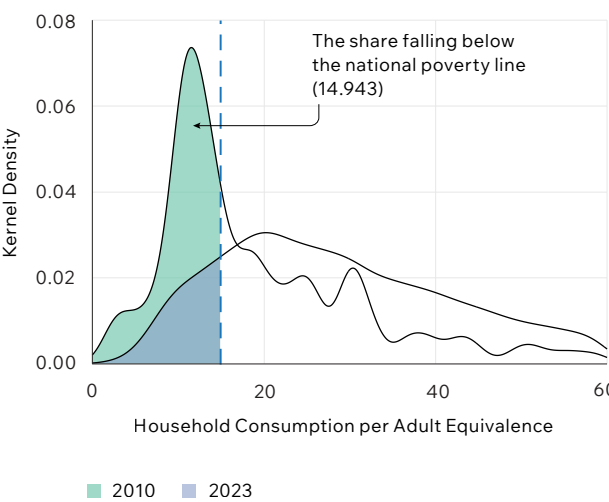


Figure 2. Kernel density function of welfare in 2010 and 2023



Source: World Bank staff calculations based on Tajikistan HBS and Listening-to-Tajikistan survey data.
Notes: Poverty rates for 2021–2024 are estimated from the modernized HBS. Poverty rates from 2010–2020 use back-casted consumption distribution comparable to 2021–2023. The back-casting methodology relies on sectoral growth-consumption elasticities. Results for 2023 and 2024 are from the modernized HBS. Results from 2010 use back-casted consumption distribution comparable to 2021–2023. The back-casting methodology relies on sectoral growth-consumption elasticities.

Box 1. Poverty measurement approach in Tajikistan

Poverty in Tajikistan is measured based on a cost-of-basic-needs (CBN) approach.

The CBN approach defines poverty lines based on the cost of acquiring essential food and non-food items needed to attain a minimum standard of living. It calculates the food component by estimating the cost of 2,250 calories per person per day and the non-food component using expenditure patterns of households just meeting their basic food needs, ensuring a realistic and context-specific measure of poverty.

The primary data source for poverty measurement is the household budget surveys (HBS) conducted by Tajikistan's National Statistical Committee (Tajstat) for 2021, 2022, 2023 and 2024. These HBS surveys were modernized to adopt computer-assisted data collection, updated sampling frameworks, and refined questionnaires, significantly improving the accuracy and reliability of poverty estimates. The focus on consumption-based welfare metrics, rather than income, addresses the challenges of seasonal fluctuations in remittances and the informal economy.

The national poverty line (NPL) and the extreme poverty line (EPL), recalibrated using the CBN approach and modernized HBS of 2021, were adopted by the Government of Tajikistan. The NPL reflects Tajikistan's developmental aspirations, standing at SM 16.02 per person per day in 2023 prices, or US\$6.62 in 2021 PPP terms, which is higher than the international poverty line for lower middle-income countries, at US\$4.2. The EPL of SM 10.16 per person per day, which is also the food poverty line, does not account for non-food needs to reflect extreme survival situations. These poverty lines have been adjusted annually since 2021 using the consumer price index (CPI) to reflect price inflation.

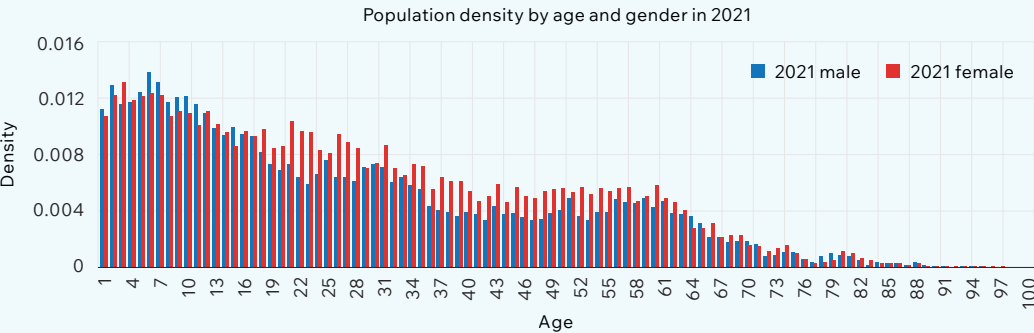
The welfare aggregate is household consumption per adult male equivalence.

Prices for valuing non-purchased food are based on unit values from the HBS, which collected information on 83 food items with a 7-day recall. Non-food consumption includes alcohol and tobacco, clothing, household services and utilities, furnishing and equipment, transportation, communication, recreation, hotels and restaurants, imputed service values of durables, health including home medication and hospital expenses, and education including tuition and school supplies, as well as tutoring fees. This consumption aggregate excludes housing rents, capital transactions (e.g., acquisition of financial assets, payment of debt and interest), taxes, insurances, and major but infrequent expenditures (e.g., marriages, dowries, births and funeral expenses).

There are two rationales for adopting an equivalence-scale approach in Tajikistan.

The first rationale is that household consumption per capita can underestimate the welfare level for households that have a significant share of women and children who usually require fewer calories than 2,250 kcal per day. The second rationale for adopting equivalence scale based on caloric requirements is that food consumption consists of a high share (nearly 70 percent) of household total consumption.

Figure 3. Due to labor migration of working-age males, there are significantly more working-age females than males in Tajikistan



Source: World Bank staff calculations based on the Tajikistan HBS.

For details regarding each methodological choice above, please refer to the Technical Note on poverty measurement in Tajikistan. This methodology is applied to all years with modernized HBS (2021–2024). The poverty rates before 2021 are back-casted based on household income portfolio and sectoral GDP growth. For details, please refer to the Background Paper I for this PEA.

These achievements remain significant when measured against other international poverty lines but are only moderate compared with some global peers.¹ Under the US\$4.20 lower middle-income line (Figure 4), poverty fell from 55 percent in 2010 to 27 percent in 2020, aligning with the progress of countries such as the Philippines and Tunisia (Figure 5), and slightly outperforming regional peers such as Kyrgyzstan. At the US\$8.30 line, representing an upper middle-income aspiration, poverty declined more gradually, from over 83 to 74 percent. Between 2015 and 2021, Tajikistan achieved a 13 percent reduction in poverty under the US\$3.65 line, reflecting steady progress, albeit at a moderate pace compared with some global peers.

Figure 4. Poverty trends under international poverty lines

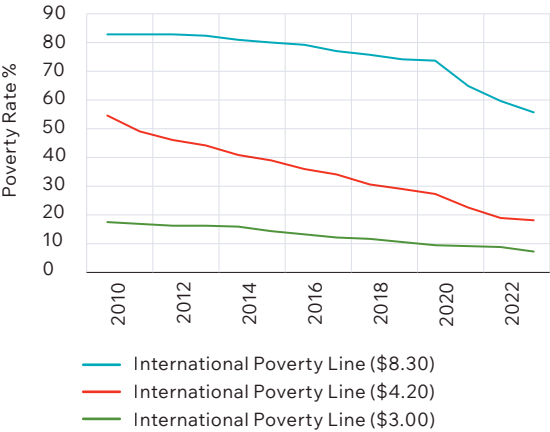
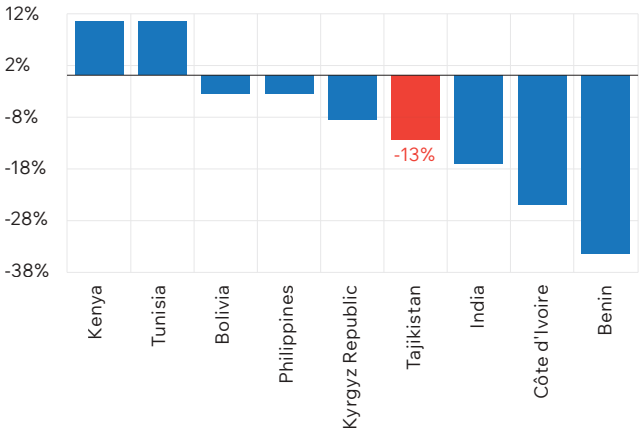


Figure 5. Compare poverty reduction progress between Tajikistan and peers, 2015–2021 (2017 PPP)



Source: World Bank staff calculations based on the Tajikistan HBS, GDP and CPI data provided by the Tajstat, and World Bank PIP.

¹ The World Bank's international poverty lines are calculated using the purchasing power parity (PPP) method, which adjusts for price differences across countries to ensure comparable living standards. In 2017 PPP terms, these lines are set at US\$2.15 per day for low-income countries, US\$3.65 for lower middle-income countries, and US\$6.85 for upper middle-income countries, based on the average national poverty lines within each income group.

Poverty declined in rural, urban and all subnational regions, but they follow different patterns.

Urban poverty (Figure 6) has been prevalent. Its faster progress in recent years widened the gap with rural areas. Among Tajikistan’s five main regions,² the Sughd region and the Gorno-Badakhshan Autonomous (GBAO) region (Figure 7) — two geographically disconnected regions — have experienced recent increases in poverty rates. Despite considerable progress, the Khatlon region and the Districts of Republican Subordination (DRS) continue to experience higher levels of poverty, with the Khatlon region decreasing from 75 percent in 2010 to 31 percent in 2024, and the DRS falling from 68 to 25 percent. The GBAO region shows a highly inconsistent decline, with poverty decreasing from 66.7 percent in 2010 to 26 percent in 2024, sharply reversing a recent spike that saw the rate climb to 43 percent in 2023 and suggesting unique geographic or socioeconomic challenges in poverty alleviation.

Figure 6. Trends in urban and rural poverty

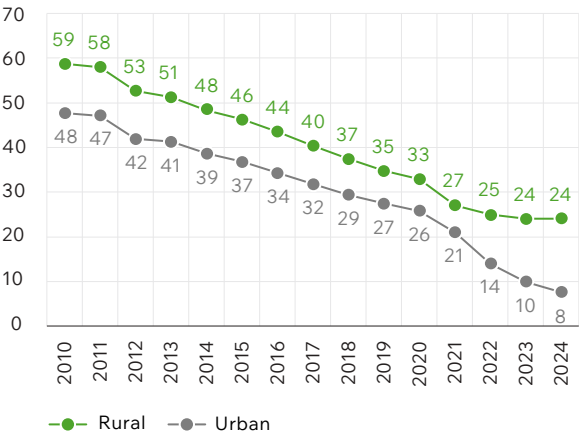
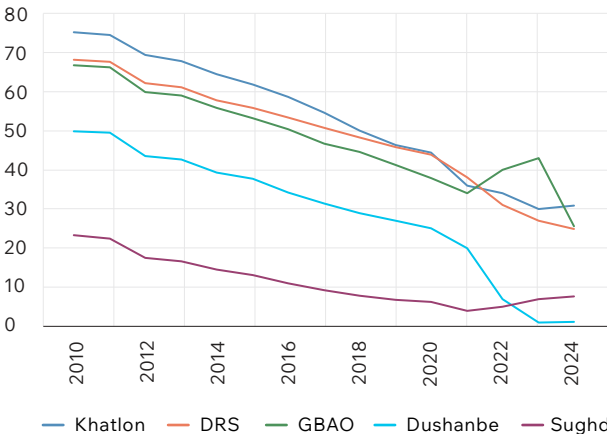


Figure 7. Trends in regional poverty



Source: World Bank staff calculations based on the Tajikistan HBS and population data provided by the Tajstat.

Access to services has improved, but human development is lagging

Non-monetary welfare and access to public services in Tajikistan have improved, particularly in water, sanitation, electricity, and mobile phone access, though disparities remain in digital access and financial inclusion. Among poor households (), access to improved water sources rose from 79 percent in 2021 to 94 percent in 2022, stabilizing at 90 percent in 2023, while improved sanitation access increased from 75 to 98 percent over the same period, narrowing the gap with the non-poor. Electricity coverage is nearly universal, but service quality remains slightly lower for the poor due to more frequent power outages. Mobile phone ownership among the poor has also increased significantly, reaching 87 percent in 2023, close to the 91 percent seen among the non-poor, underscoring its importance for digital connectivity and economic opportunities. However, financial inclusion remains limited, with less than 1 percent of the poor owning a bank account or mobile banking. Overall access to a bank account or mobile banking remains low at 11 percent of the population. Financial access has improved for non-poor households, but a gender gap persists, with men (17.1 percent) having greater access to financial services than women (10.6 percent) in 2023.

² There are 5 administrative regions at the subnational level including Dushanbe, DRS, Khatlon, GBAO, and Sughd. Dushanbe is the capital of the country.

Table 1. Access to services for the poor and non-poor

		National	Rural	Urban	Poor	Non-poor
Access to improved water	2021	87	80	100	79	88
	2022	91	86	100	94	90
	2023	89	86	98	90	89
Access to improved sanitation	2021	83	77	96	75	85
	2022	83	77	95	82	83
	2023	96	95	100	98	96
Mobile phone ownership	2021	89	86	96	68	94
	2022	87	85	91	68	90
	2023	90	92	84	87	91
Owning a bank account	2021	1	1	1	1	1
	2022	4	5	4	1	5
	2023	11	5	18	1	14

Source: World Bank staff calculations based on the Tajikistan HBS.

However, about 30 percent of school-age children (7–17 years old) are not enrolled in schools (Figure 8), prevalent in both urban and rural areas. Many of these children (38 percent) are from poor households. Both urban and rural areas have more than one-quarter of school-age children reportedly not enrolled in schools — a trend that has worsened after the pandemic, especially in rural areas where 34 percent of school-age children are not enrolled. There is a discrepancy in these trends with the administrative data, which show more than 90 percent of the children enrolled in schools. However, the Listening-to-Tajikistan survey, which is independently collected by the World Bank, also shows a worsening trend (Figure 9) especially among the girls in primary and upper-secondary schools. Enrolment issues are more prevalent among the poor. In 2023, over half of poor children aged 7 to 10 were not enrolled in primary school, compared with 25 percent of non-poor children. School enrolment rates decline as children progress to lower-secondary and upper-secondary school levels.

Figure 8. Share of children 7–17 not enrolled in schools

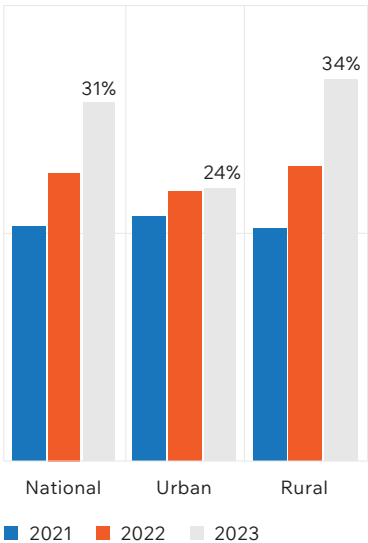
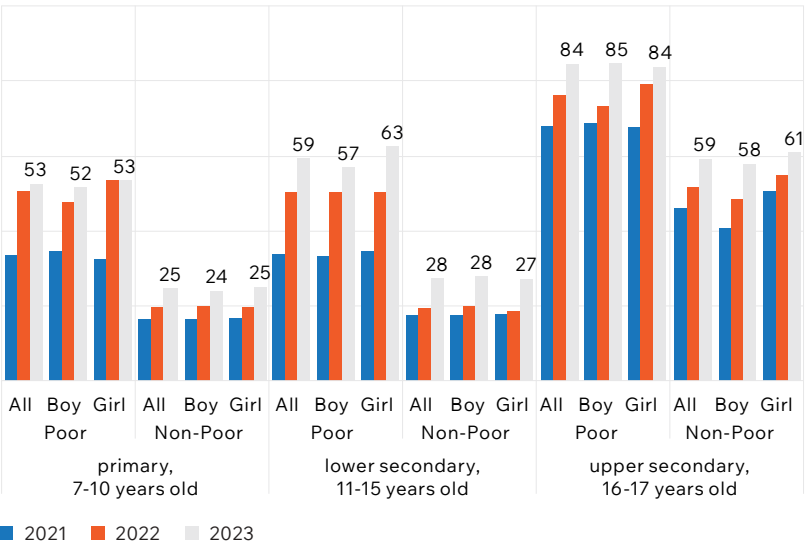


Figure 9. Share of children not enrolled by educational level, gender, and poverty status (%)



Source: World Bank staff calculations based on the Tajikistan HBS.

Inequality of opportunity drives the gaps in school enrolment. Factors such as budget constraints, having a migrant household member, the distance to educational institutions, and the educational background of parents are closely associated with children not being enrolled in school. School enrolment declines with age but increases with higher household consumption (Table 2. Marginal effects of factors contributing to the probability of being out of school for children (%)), suggesting financial barriers for low-income families. Having a migrant in the household boosts school enrolment by 6.7 percentage points due to increased income. Compared with boys, girls have a slightly higher likelihood of being out of school, by about 2 percentage points. Children are more likely to attend school if adults in the household have higher education levels. The poor in Tajikistan face longer distances to travel to education living an average of 12.93 kilometers from the nearest education facility compared with 6.42 kilometers for non-poor households.

Table 2. Marginal effects of factors contributing to the probability of being out of school for children (%)

	Poor	Non-poor	Total
Distance to an education facility (km)	0.38	0.45	0.38
Decile of consumption	-2.01	-1.71	-1.72
Children's gender (== girl)	1.45	1.23	1.24
Has a migrant household member	-7.90	-6.60	-6.70
Parents' average years of education	-0.26	-0.22	-0.23

Source: World Bank staff calculations based on the HBS 2023.
Notes: Estimates are the average margin effect to the probability of having enrolled in school from a probit regression model controlling for: (i) household characteristics – household poverty status, consumption decile, number of children, number of migrants, presence of a migrant, average years of education among adults, household size; (ii) individual characteristics – gender of the child; and (iii) regional characteristics – provincial identifiers. The poor also have low utilization of health services, being deterred from accessing medical services due to the high costs and inconvenient access. In 2023, the non-poor were five times more likely to use medical services than the poor. Among the poor, 34 percent cited expense as a barrier to seeking care (Figure 11), nearly four times the rate of the non-poor. Though fewer people mentioned distance as a reason, the poor live twice as far from medical facilities (Figure 10), adding another layer of difficulty.

Figure 10. Distance to a health facility

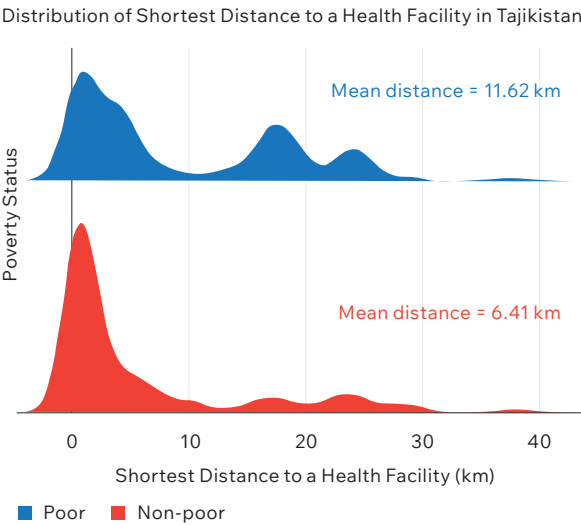
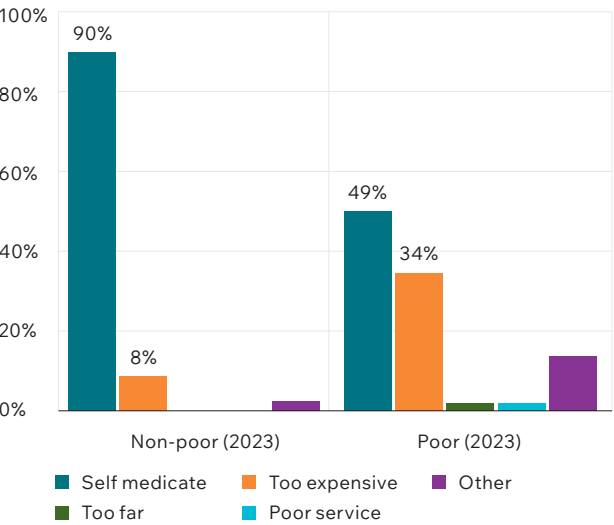


Figure 11. Reasons for not using medical services



Source: World Bank staff calculations based on the Tajikistan HBS and population data provided by the Tajstat.

Low human capital outcomes contribute to multidimensional deprivations. The Multidimensional Poverty Index (MPI) captures the interconnectedness of monetary and non-monetary deprivations in a composite index (Figure 12). The monetary dimension is based on the national poverty standard. The education dimension (Figure 13) is measured by enrolment of school-age children and years of schooling of adults. The living standards are captured by housing quality, access to electricity, improved drinking water, and improved sanitation. A household is considered multi-dimensionally poor if it is deprived in 33 percent of the dimensions. The resultant index indicates that poverty levels in rural areas have not improved since 2021. This stagnation is primarily driven by poor educational outcomes which accounted for more than half the share of multi-dimensionally poor in 2023.

Figure 12. Share of population in multidimensional poverty (%)

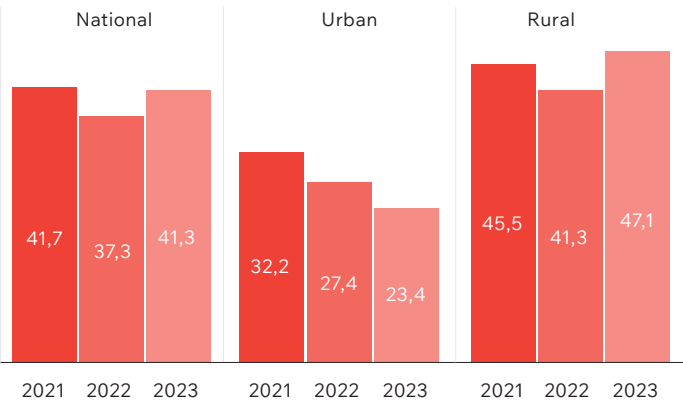
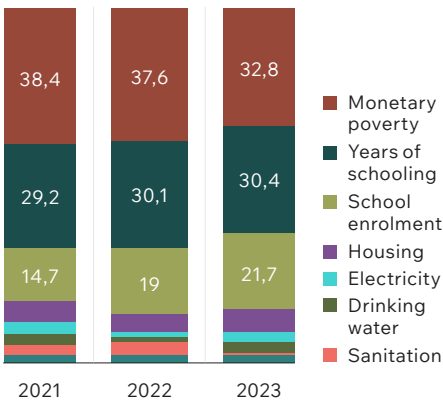


Figure 13. Contributions to MPI, by element (%)



Source: World Bank staff calculations based on the Tajikistan HBS provided by the Tajstat.

Notes: 1. Improved drinking water sources include piped water, protected wells/spring/boreholes, rainwater, and packaged or delivered water. 2. Improved sanitation facilities include flush/pour flush toilets connected to piped sewer systems, septic tanks or pit latrines; pit latrines with slabs (including ventilated pit latrines), and composting toilets, and not shared with other households. The MPI calculation does not consider sharing and emptiness. 3. Housing: Inadequate house materials if the main material is poor: floor (mug/dung, bamboo/reed/wood planks); roof (thatch, wood and mud, bamboo/reed, plastic cover), or walls (wood and mud, wood and thatch, wood, stone, stone and mud, blocks (unplastered), parquet or polished wood, chip wood, bamboo/reed, plastic).

Poverty profiles

The poor mostly live in dense farming regions with low human capital and poverty rises with altitude.

Poverty in Tajikistan is heavily concentrated in the Khatlon region and the DRS, which account for 86 percent of the country’s poor. As the most agriculture-dependent region, Khatlon alone is home to nearly 55.5 percent of the poor (Table 3), followed by the DRS (30.1 percent). Although the Sughd region is as populous as Khatlon and the DRS with 28.6 percent of the population in Tajikistan, only 11.3 percent of the poor live in Sughd. The GBAO region, with a poverty rate of 25.5 percent, has the smallest share of the population (2.3 percent).

The poor in Tajikistan are characterized by low education levels, limited job opportunities, and heavy reliance on remittances, leaving them vulnerable to economic instability and restricted pathways to upward mobility. Low education levels are a key factor, with 88.2 percent of the poor having only general secondary education or less. Households without migrant members are more likely to be poor, as poverty rates nearly halve when a migrant is present. Despite limited migration opportunities, the poor rely heavily on remittances, which make up a significant share of their income due to restricted access to stable, higher-paying jobs in industry and skilled services.

In contrast, the non-poor benefit from a more diverse income base, including industry, skilled services, and innovation-driven activities, while the poor largely remain dependent on agriculture and labor-intensive services, making them more vulnerable to economic shocks.

Poverty in Tajikistan is closely tied to geography, with higher elevations experiencing significantly greater economic hardship due to isolation and limited access to opportunities. Geography plays a significant role in poverty distribution. The majority of the population (77.1 percent) lives below 1,000 meters, where the poverty rate is 20.7 percent, yet this altitude range accounts for 80.4 percent of the country’s poor. Poverty rates drop to 13.7 percent between 1,000 and 2,000 meters but rise sharply at higher elevations, reaching 34.5 percent between 2,000 and 3,000 meters. Very few people live at higher altitudes; the poverty rate is 3.9 percent for those living above 3,000 meters.

Table 3. Poverty distribution and population share by geographic, demographic, and income source (%)

	Population share (%)	Poverty rate (%)	Share of the poor (%)
Rural	74.4	24.1	90.1
Urban	25.6	7.6	9.9
Dushanbe	9.3	1.1	0.5
Sughd	28.6	7.7	11.3
Khatlon	35.8	30.9	55.5
DRS	23.9	24.8	30.1
GBAO	2.3	25.5	2.6
Has remittances	49.1	16.9	41.8
No remittances	50.9	22.7	58.2
Age 0–17	37.1	21.7	40.4
Age 18–60	51.2	19.2	49.4
Age 61+	11.7	17.1	10.1
General secondary education and lower	76.7	17.1	88.2
Technical secondary education and above	23.3	7.5	11.8
Altitude < 1,000m	77.1	17.6	80.4
1,000m <= Altitude < 2,000m	21.2	13.7	17.1
2,000m <= Altitude < 3,000m	1.2	34.5	2.5
3,000m <= Altitude	0.5	3.9	0
Agricultural income	77.9	18.2	65.3
Industry income	34.1	12.7	20
Services – finance and ICT	1.9	7.5	0.7
Services – labor intensive tradable	16.7	11.4	8.8
Services – low-skill non-tradable	16.7	11.4	8.8
Services – education and health	18.7	13.7	11.8

Note: The data for all sections of this table are based on 2023 estimates, except for the sectoral breakdown of income sources (agricultural income, industry income, and various service sectors), which is derived from 2022 data.

Chapter II.

Inequality and Growth Patterns

Inequality has increased as growth disproportionately favored urban populations and non-poor individuals, particularly in the post-COVID-19 years. This has resulted in higher inequality in rural areas, surpassing urban levels. Remittances, which have substituted agricultural income, are one of the main factors contributing to the rising rural inequality.

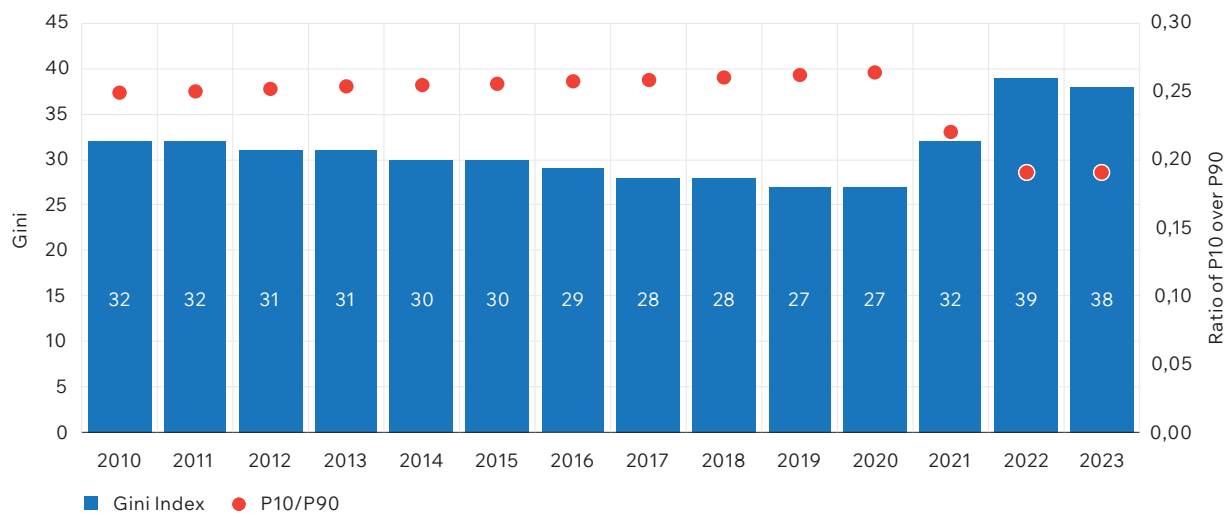
Inequality trends

Rural inequality rose, driven by education gaps and remittances.

Tajikistan’s journey toward shared prosperity — growth of the bottom 40 percent — reflects both strides toward inclusion and moments of disparity. From 2010 to 2019, the bottom 40 percent of the population experienced steady progress, with consumption growing at around 2–3 percent annually, slightly outpacing the national average. However, the post-pandemic recovery painted a starkly different picture. In 2021, while shared prosperity surged to an impressive 13.1 percent, the gains disproportionately favored the wealthier population until 2023, when growth for the poorest segments rebounded.

Inequality in Tajikistan therefore started to increase after years of gradual decline. From 2010 to 2019, the Gini coefficient steadily decreased from 32 to 27, signaling a decline in overall inequality (Figure 14). However, inequality began rising again from 2021, reaching 39 by 2022 before slightly reducing to 38 in 2023. Similarly, the consumption ratio between the 10th percentile and the 90th percentile remained relatively stable at about 0.25 until the onset of the COVID-19 pandemic, when it dropped to 0.2, indicating worsened disparities between the lowest and highest earners.

Figure 14. Trends in consumption inequality



Source: World Bank staff calculations based on the Tajikistan HBS, GDP and CPI data provided by the Tajstat. Results for 2021–2023 are from the modernized HBS. Results from 2010–2020 use back-casted consumption distribution comparable with 2021–2023. The back-casting methodology relies on sectoral growth-consumption elasticities.

Rising inequality in Tajikistan is mainly due to higher levels of inequality in rural areas, caused by more regressive growth patterns compared with urban areas. In rural Tajikistan (Figure 15), the Gini coefficient was 40 in 2022 and 39 in 2023. This level of inequality would classify a country as being one with high inequality based on World Bank standards. The higher rural than urban inequality observed in Tajikistan is not the global norm. Studies across countries such as China, India, and Brazil show that urban inequality often outpaces rural inequality as cities act as hubs of economic growth and migration. For instance, Kanbur and Zhang (2005) highlight that urban inequality in China was driven by industrial reforms and migration policies, while Deaton and Dreze (2002) find similar drivers in India. However, Tajikistan diverges from this norm. The Theil index decomposition reveals that the increase in rural inequality post-pandemic is primarily attributed to disparities within rural areas rather than an escalating rural-urban disparity. This is because the consumption growth pattern is more regressive in rural than urban areas, as confirmed by growth incidence curves (Figure 16).

Figure 15. Trends in rural and urban inequality

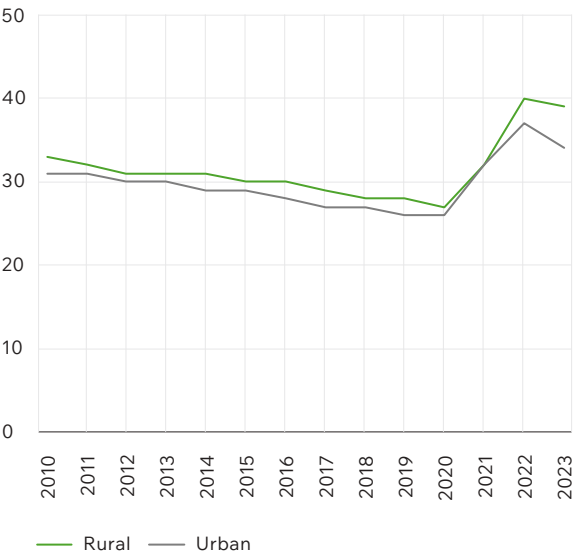
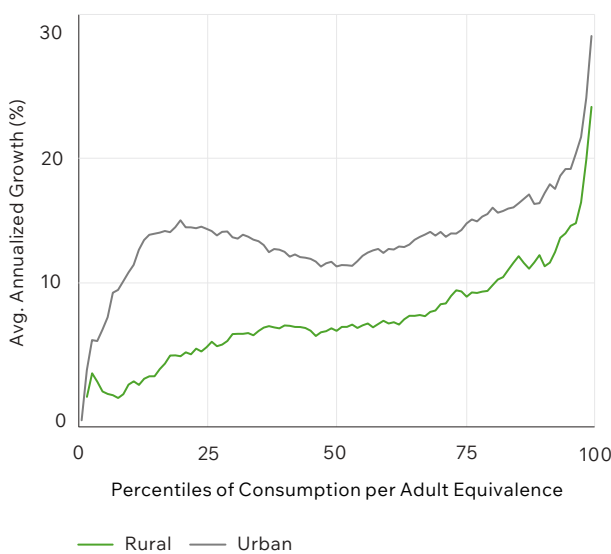


Figure 16. Growth incidence from 2020 to 2023



Source: World Bank staff calculations based on the Tajikistan HBS.
Notes: Results for 2021–2023 are from the modernized HBS. Results from 2010–2020 use back-casted consumption distribution comparable with 2021–2023. The back-casting methodology relies on sectoral growth-consumption elasticities.

Remittances have contributed more to rising rural inequality than labor incomes from various sectors. Results from a rigorous statistical decomposition technique — a Recentered Influence Functions (RIF) approach — suggests that changes in rural Gini coefficients from 2021 to 2022 are attributable to different income sources and human capital endowments (Figure 17). Disparities in education attainment — which determine access to income opportunities such as migration and jobs in the services sector — are the largest source of rural inequality, contributing to an 8 Gini-point increase. However, this contribution is almost entirely driven by the coefficient effect, reflecting the stronger association between education and welfare outcomes, rather than by changes in education levels themselves over time (the endowment effect), which accounts for only -0.011 Gini points.³ Similarly, remittances contributed 4.6 Gini points to the increase in inequality, largely due to their growing impact on welfare disparities (coefficient effect), rather

³ The RIF Oxaca-Blinder decomposition analysis decomposes the variables’ associations with GINI into an endowment effect (the changes in the level of the variables), a coefficient effect (the changes in the association between the variable and outcome), and an interaction effect of the former two.

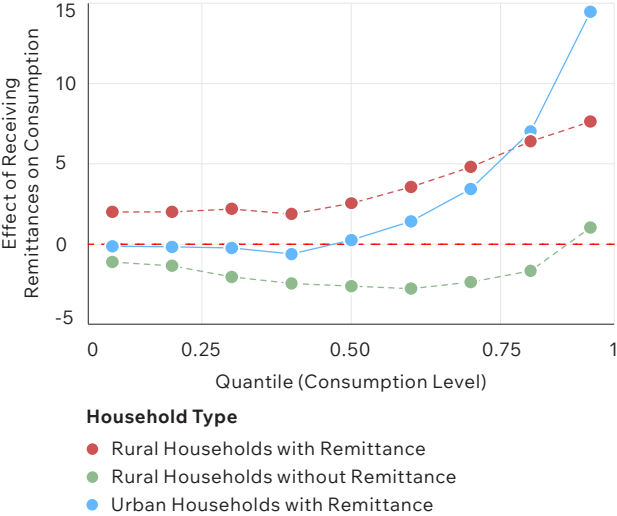
than significant changes in remittance flows or coverage across households. Incomes from agriculture and industry reduced the rural Gini coefficient. Remittances are a large source of income in Tajikistan. In 2022, 33 percent of rural households had members migrating abroad, compared with 25 percent of urban households, showing higher reliance on remittance income in rural areas. By 2023, the share of migrating households decreased slightly to 25 percent in rural areas, coinciding with a slight decline in the Gini coefficient, although the difference between rural and urban households persisted. However, remittances in Tajikistan have boosted the consumption of wealthier households more than poorer households (Figure 18), indicating a regressive trend.

Figure 17. Regression-based approach in decomposing Gini changes from 2021 to 2022

Variable	Contribution
Adult's average years of education	8.0
Having remittance transfer	4.6
Having service sector income	0.7
Having capital gain	0.1
Having other transfer	-0.1
Other residuals	-1.3
Having industry sector income	-1.5
Having agriculture sector income	-1.8
Total ΔGini = +8.57	

Source: World Bank staff calculations based on the Tajikistan HBS.
Notes: We use a Recentered Influence Function-based decomposition approach. First, we model how variables like human capital, sector-specific incomes (agriculture, industry, services), and transfers (remittances, public transfer and other transfer), and capital gains relate to Gini each year. Then, we compare changes in average levels of these attributes and their impact on inequality from 2021 to 2022. Summing these partial effects reveals the contribution to the overall shift in the Gini.

Figure 18. The effects of remittances on consumption across different quantiles



Source: World Bank staff calculations based on the Tajikistan HBS.
Notes: The Recentered Influence Function shows remittances' impact at various consumption levels (0th–10th deciles). The blue line indicates the effect on urban households, the red dashed line on rural households, and the green dotted line is the baseline for rural households without remittances. Results show a stronger impact on rural households across all levels.

Regional patterns of growth

Growth began to favor urban areas and higher-income populations

Dushanbe has shown a growth pattern that reduces poverty and promotes inclusive growth in urban areas that is less dependent on remittances, unlike the migration-driven model in rural areas, which can increase inequality. Tajik individuals migrate to the Russian Federation when local employment opportunities are insufficient, particularly in rural areas. Among all regions, Dushanbe has the lowest percentage of households with a migrant member (16 percent). This indicates that Dushanbe is the least reliant on remittances. The growth pattern of Dushanbe is also the most inclusive (Figure 20). In the post-pandemic years, while other regions experienced regressive growth where the wealthy benefited more than the poor, Dushanbe maintained an inclusive growth pattern. As a result, Dushanbe successfully reduced its poverty rate from 50 percent in 2010 to below 2 percent in 2023.

Figure 19. Growth incidence curve, National, 2021-23

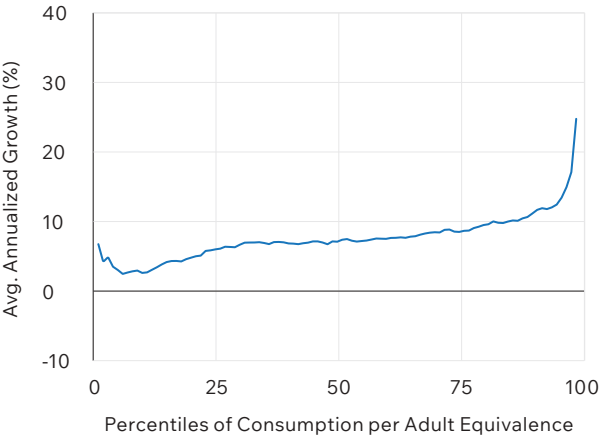


Figure 20. Growth incidence curve, Dushanbe, 2021-23

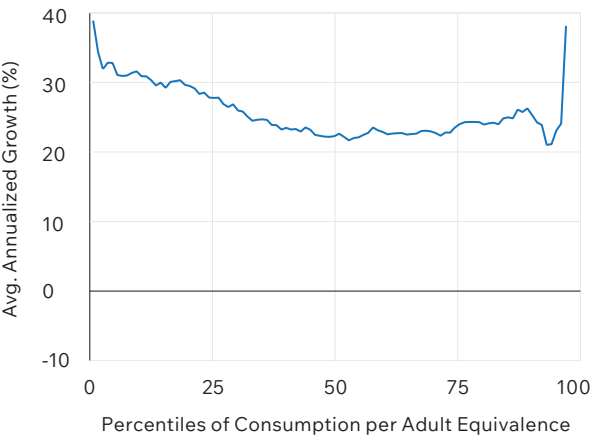


Figure 21. Growth incidence curve, DRS, 2021-23

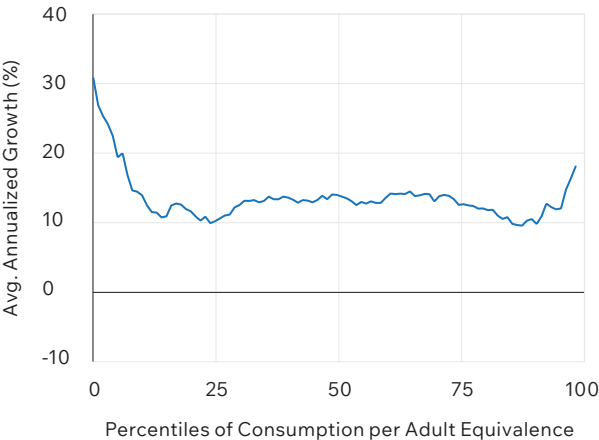


Figure 22. Growth incidence curve, Khatlon, 2021-23

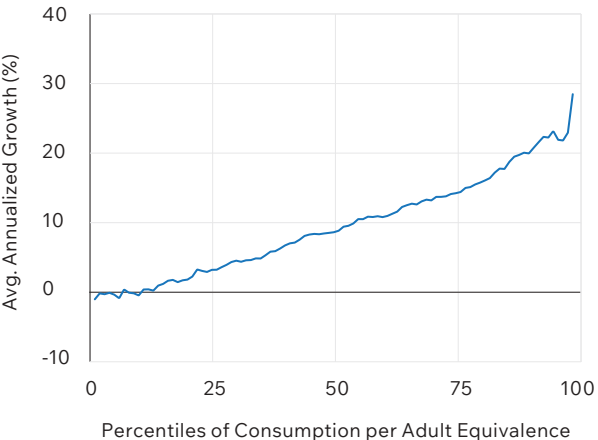


Figure 23. Growth incidence curve, Sughd, 2021-23

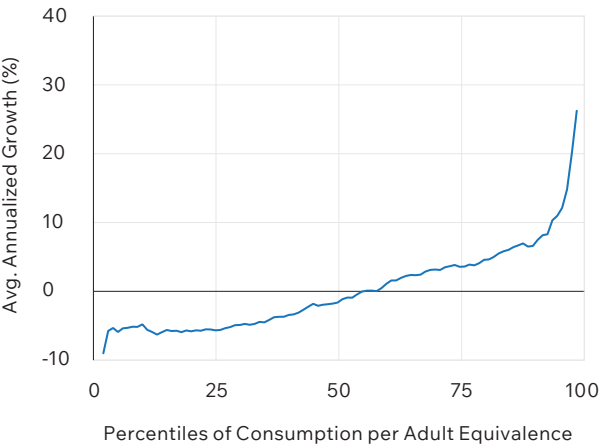
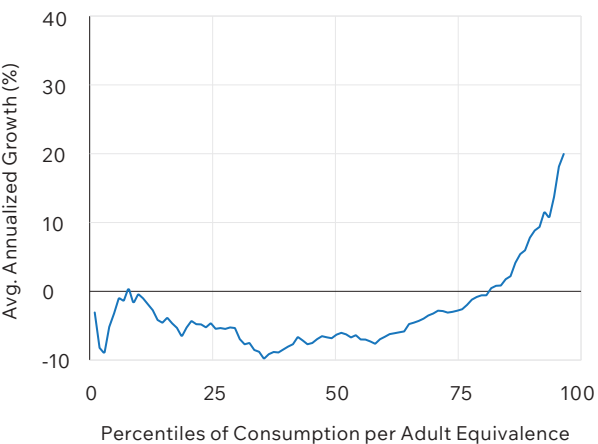


Figure 24. Growth incidence curve, GBAO, 2021-23



Source: World Bank staff calculations based on the Tajikistan HBS.

Chapter III.

Poverty Reduction Drivers and Barriers

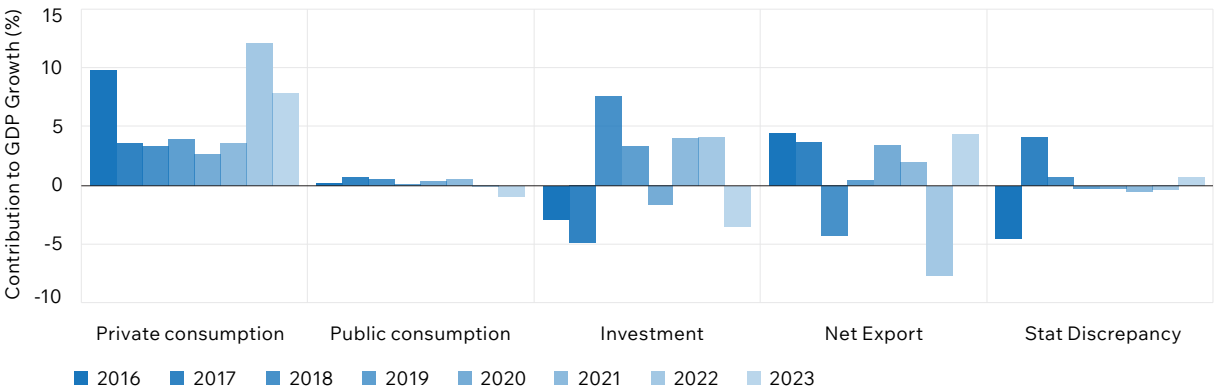
Growth drove poverty reduction, but more could have been achieved had growth been more equal. Job creation played a limited role, with increasing returns within sectors being the driver of incomes instead. As a result, migration became an outlet for those seeking new opportunities, making remittances a main driver of poverty reduction. Insufficient job creation, increasing returns within sectors, and seeking migration as an outlet explain why inequality increased. Education is tied to all these factors, as it determines access to existing opportunities and the inequalities in remittances.

Growth pattern and poverty reduction

Being consumption driven, growth translated into high poverty reduction.

Tajikistan’s economic growth is private consumption driven, underscoring the country’s reliance on remittance-driven spending. Over the past decade, GDP grew by an average of 7 percent annually. Private consumption drove over 80 percent of this growth each year, while investment and net-export effects varied, and government spending had minimal impact (Figure 25). This dominance of private consumption is fueled by substantial remittance inflows, which in 2023 constituted about 37 percent of GDP. These remittances, sent largely by Tajik labor migrants working abroad, primarily in the Russian Federation, are a lifeline for many households.

Figure 25. GDP Contributions by expenditure elements



Source: The TajStat and World Bank staff calculations.

As a result, Tajikistan’s poverty growth elasticity has been relatively strong in most years, often exceeding 1, demonstrating that GDP growth has had a significant impact on poverty reduction (Figure 27). In key growth years such as 2012 and 2021, poverty reduction was highly responsive to GDP increases, with elasticity levels comparable to those achieved during China’s rapid poverty reduction phases. For example, in the 2000s and early 2010s, China’s poverty growth elasticity reached 1.02 and 2.66, respectively, driven by targeted reforms such as agricultural modernization, rural infrastructure development, and expanded market access for smallholder farmers. Similarly, other countries such as Brazil and Vietnam have achieved high

poverty-growth elasticities in periods of inclusive economic growth. Brazil's pro-poor growth during the early 2000s, supported by conditional cash transfer programs such as Bolsa Família, combined with sustained GDP growth, significantly reduced poverty with elasticity estimates above 1. Vietnam also exhibited strong elasticities during its economic reform era (Doi Moi), during which rapid GDP growth coupled with equitable rural development helped reduce poverty dramatically (Figure 28). However, while Tajikistan's poverty-growth elasticity is promising, but dipping sharply in years such as 2020 at the start of the COVID-19 pandemic (Figure 27).

Figure 27. Poverty growth elasticity in Tajikistan

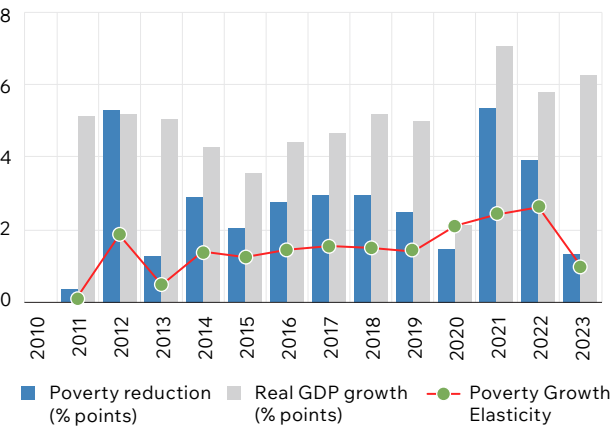
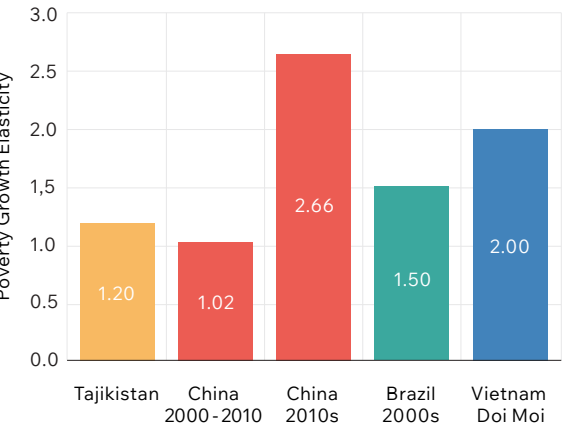


Figure 28. Poverty growth elasticity across selected countries and periods

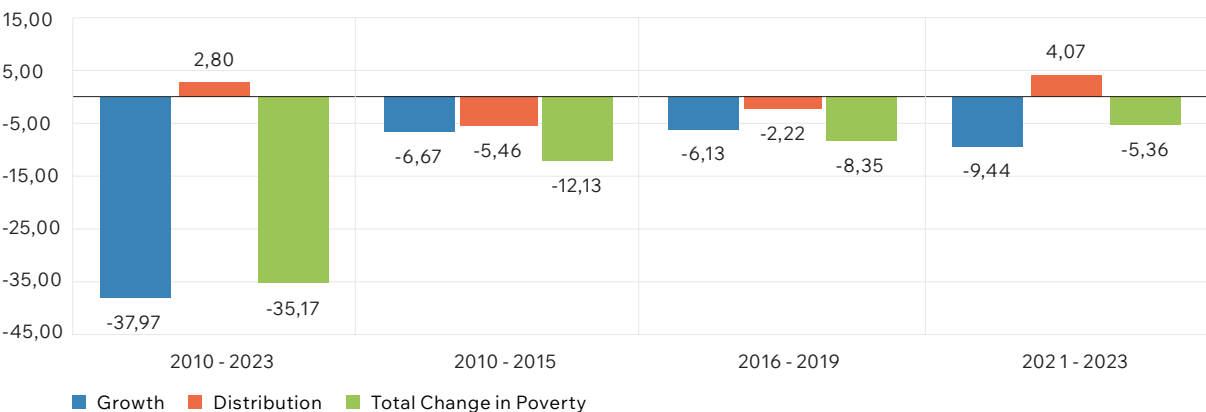


Source: World Bank staff calculations based on the Tajikistan HBS and GDP data provided by the Tajstat. Poverty growth elasticities of China, Brazil, and Vietnam are from Ravallion and Chen (2007), Barros et al. (2009), Dollar and Glewwe (1998).

Growth could have reduced poverty more if inequality hadn't increased

Growth was the main driver of poverty reduction, but more could have been achieved had growth been more equal. From 2010 to 2023, the poverty rate declined by 35.3 percentage points, fully driven by economic growth. However, growth could have reduced poverty by 38 percentage points had it not been for rising inequality offsetting 2.6 percentage points of the decline (Figure 29). Rising inequality has become an increasing impediment to poverty reduction in recent years. Notably, from 2021 to 2023, distribution effects counteracted almost half of the impact of growth on poverty reduction.

Figure 29. Decomposition of the poverty reduction progress into growth and distribution factors



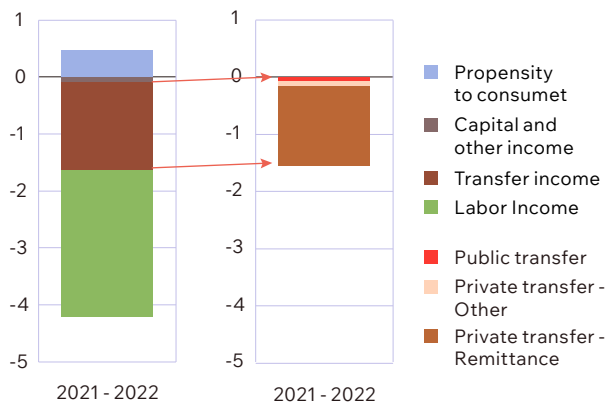
Source: World Bank staff calculations based on the Tajikistan HBS.

Poverty Reduction Drivers by Income

Wage growth and remittances, rather than domestic job creation drove poverty reduction

Poverty reduction has been primarily influenced by growth in labor incomes and remittances. Labor income contributed a 2.57-percentage-point reduction in poverty, accounting for 73 percent of the overall progress. Transfer incomes resulted in a 1.55-percentage-point decrease in poverty, contributing 43 percent to the overall improvement (Figure 30). Meanwhile, a lower propensity to consume, representing in a higher savings rate, partially offset the reduction in poverty from labor income and transfer incomes. Capital incomes had a minimal impact due to the early development stage of the capital market in Tajikistan. Within transfer incomes, remittances were the main driver of poverty reduction. Remittances account for about 30 percent of the national GDP and are hence an important source of income for the domestic economy. The effect of public transfers on poverty reduction was negligible, because on-pension public transfers reach less than 15 percent of the poor households, indicating under-coverage of the Targeted Social Assistance (TSA) program.

Figure 30. Shapley decomposition of poverty reduction by income types

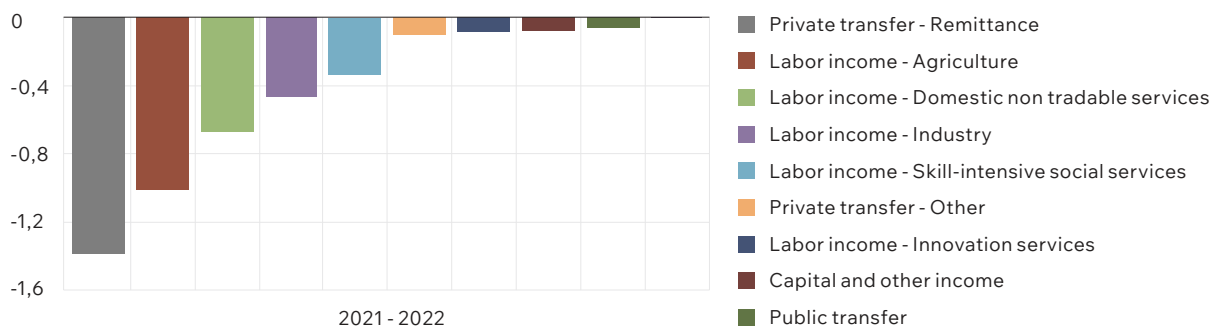


Source: World Bank staff calculations based on the HBS 2021 and 2022.

with those in agriculture and industry. Within the services sector, jobs classified as “domestic non-tradable services”, such as administrative and support services, real estate, entertainment and recreation, and household services, and those categorized as “skill-intensive social services,” including education, health, public administration, defense, and compulsory social security, have shown a stronger correlation with poverty reduction than other services jobs. The effects of industry jobs fall between these two subsectors.

The services and agriculture sectors have been more effective in reducing poverty compared with the industry sector. When labor incomes are analyzed by sector, jobs in the services sector (42 percent) and the agriculture sector (29 percent) contributed the most to poverty reduction (Figure 31). Despite having the lowest per capita income among all sectors, agriculture remains a significant source of income due to its accessibility. More than two-thirds of both poor and non-poor households depend on agriculture for income. Jobs in the services sector exhibit greater diversity compared

Figure 31. Drivers of poverty reduction by income and labor sectors



Source: World Bank staff calculations based on the HBS 2021 and 2022.

Table 4. Extensive and intensive margins of income sources

	Share of households receiving this income (%)				Per capita income for those receiving (som/month)			
	National		Poor in 2021		National		Poor in 2021	
	2021	2022	2021	2022	2021	2022	2021	2022
Remittance	33	38	23	31	566	598	299	383
Agriculture	51	51	43	47	259	253	136	169
Service: domestic low skill non-tradable	14	17	12	12	433	589	281	473
Industry	35	34	26	26	705	818	442	577
Service: education and health	19	19	15	15	258	262	166	227
Other private transfer	5	5	3	3	217	292	63	261
Services: finance and ICT	2	2	2	2	254	331	156	262
Public transfer	47	48	47	47	82	81	61	70
Capital and other	5	6	3	5	455	448	157	184
Services: Commerce, transportation, catering and hotels	18	17	12	13	510	580	247	373

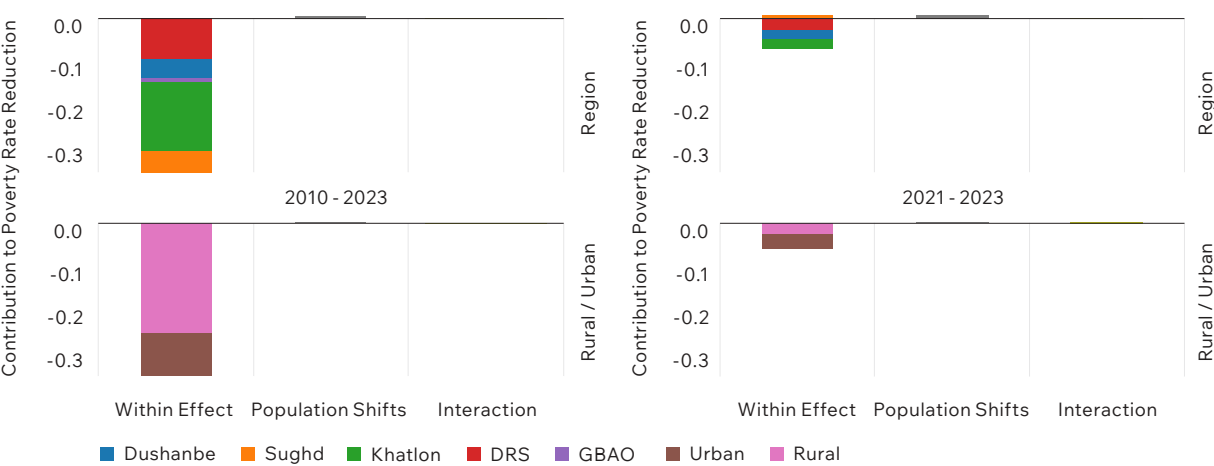
Source: World Bank staff calculations based on the HBS 2021 and 2022.

However, limited job creation restricted the expansion of income sources hence labor incomes growth was primarily driven by rising returns rather than livelihood transformation. Income sources outside of remittances, and incomes from agriculture, and low-skill non-tradable services, have failed to expand significantly. As a result, income growth has mainly come from higher average incomes among existing earners (Table 4), with non-poor individuals seeing greater increases than the poor, which is consistent with growing inequality. While agriculture and low-skill services jobs also saw some income increases, helping to drive poverty reduction, these carry less weight. For instance, fewer poor households received industry incomes, despite these being the highest paid jobs with a substantial increase in average industry wages. Meanwhile, although public transfers cover about 47 percent of the population, the average amount received from these transfers is the lowest among all income sources.

Limited labor mobility impedes structural transformation

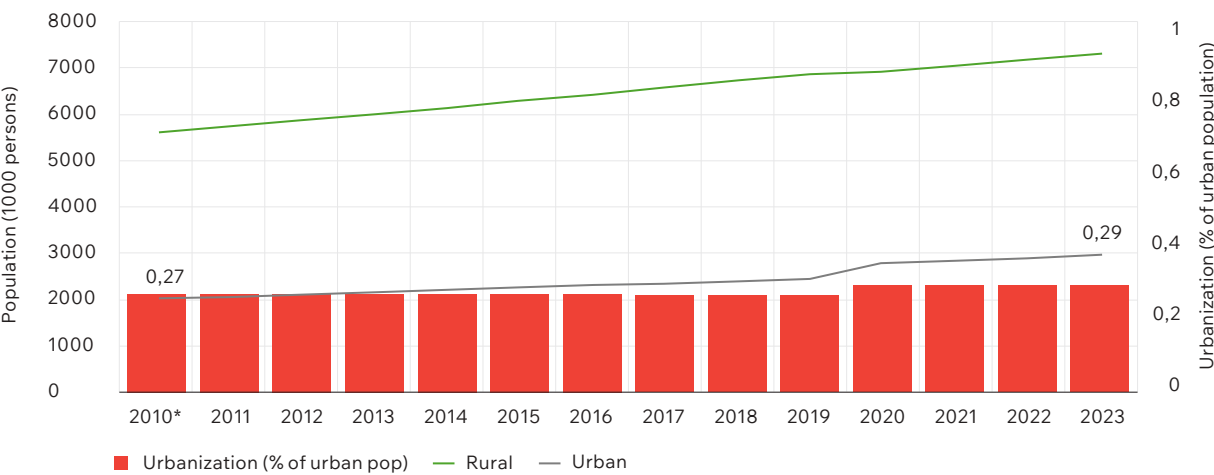
Sluggish sectoral mobility is hindering structural transformation and urbanization — key poverty reduction drivers in other countries — slowing Tajikistan’s progress toward sustainable livelihoods and economic growth. A competitive and healthy labor market allows labor to move freely between the agriculture, industry, and services sectors, and from rural to urban markets, promoting structural transformation that transitions workers from low-productivity agriculture to higher-productivity industry and services. However, these types of labor movements across sectors have failed to occur in Tajikistan. At the subnational level, poverty reduction primarily has taken place within regions rather than between them because internal migration between regions is very low, at less than 5 percent (Figure 32). While some individuals pursue labor migration opportunities abroad, the lack of domestic job prospects likely explains why cross-regional migration has had minimal impact on poverty reduction. A similar pattern is noted between urban and rural areas: shifts between these locations has had little effect, with rural areas contributing the most to poverty reduction progress. Meanwhile, the rate of urbanization, as measured by the share of urban population, increased by only 2 percentage points from 2010 to 2023 (Figure 33).

Figure 32. Within versus between region decomposition



Source: World Bank staff calculations based on the Tajikistan HBS.

Figure 33. Stalled urbanization process



Source: World Bank staff calculations based on the Tajikistan HBS.

Chapter IV. Aspiring to Join the Middle Class in Tajikistan

Deep Dive

Alisher Rajabov | Wondimagegn Mesfin Tesfaye



Photo: The World Bank Tajikistan Country Office Photo Collection.

Abstract

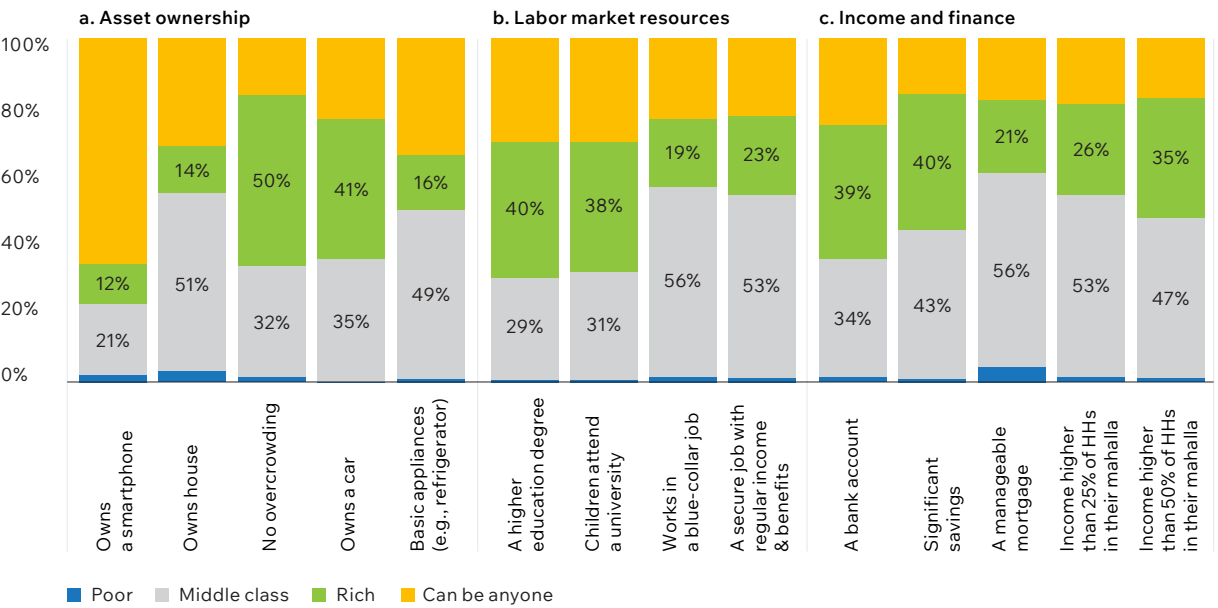
This deep-dive explores the size, evolution, distribution, and characteristics of the “middle class” in Tajikistan. A middle-class threshold is defined based on vulnerability and economic security concept utilizing panel data from the Household Budget Survey (HBS). Tajikistan’s middle class has grown significantly, especially post-COVID-19 pandemic, from 24 percent in 2021 to 33 percent in 2024. This growth is strongest in urban areas, driven by labor income from non-agriculture sectors and private transfers. A notable share of households did not change economic class, reflecting path dependence. There is also a gradual progression of households across socio-economic classes and upward mobility, with the middle class having a negligible probability of falling into poverty. Labor mobility — into medium- and high-skilled occupations, out of agriculture and out of the country — is the key determinant of transition into middle-class status. After controlling for occupational resources and change in labor-market standing, demographic factors, exposure to weather shocks, and location have a significant association with joining and staying in middle class, underscoring the importance of geographical and institutional factors.

1. Size, Distributions, and Trends of the Middle Class

The “middle class” in Tajikistan is defined by the concept of economic security

In the eyes of the Tajik people, attainment of middle-class status is an economic concept associated with reduced vulnerability. The latest World Bank Listening-to-Tajikistan (L2T) survey indicates that owning a house, car, and basic household appliances signifies middle-class status or wealth (Panel a of Figure 1). Higher education, blue-collar employment, and having a secure job with regular income and benefits are labor market and human capital traits of the middle class or rich (Panel b of Figure 1). Having a bank account, significant savings, and manageable mortgage also mark middle-class status (Panel c of Figure 1). In addition, middle-class households typically have income exceeding 25 percent of households in the community. These attributes indicate economic security as they signify stability and the ability to withstand shocks, which is crucial for defining middle-class status.

Figure 1. Attributes of the middle class in Tajikistan



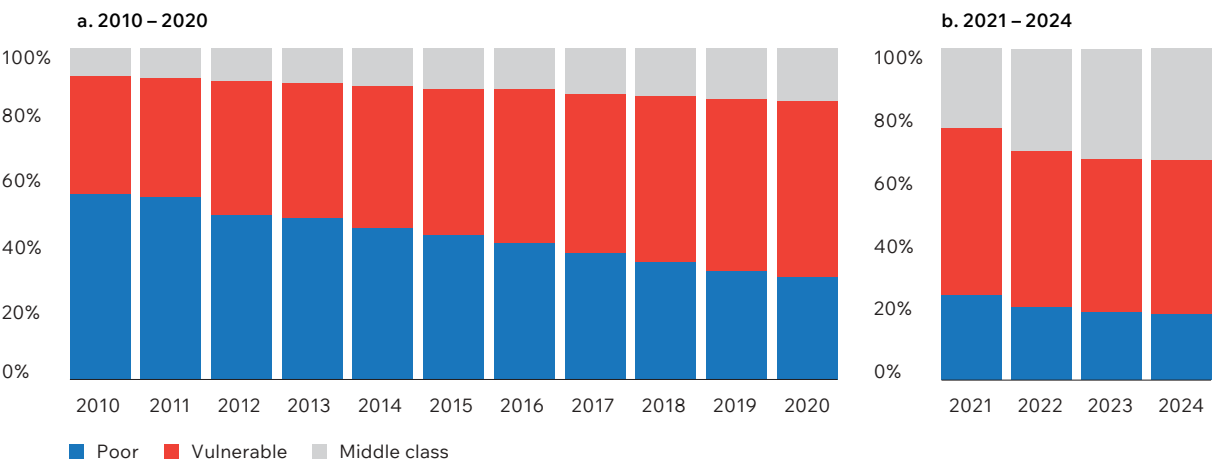
Source: World Bank staff calculations based on Listening-to-Tajikistan (L2T) survey 2023–2024.
Notes: The survey asks which economic class (self-identified) possess the attributes analyzed.

As such, the middle-class threshold in Tajikistan is defined based on minimizing vulnerability to falling into poverty. Statistical modeling from the HBS data shows that vulnerability to poverty is minimized when people attain consumption of at least 2.23 times the national poverty line, i.e., SM 33.32 per adult per day. This is the minimum consumption level associated with a 10 percent risk of falling into poverty over a three-year period and is therefore used as the middle-class line in Tajikistan. Tracking the same households across time shows that 3.5 percent of households consuming at least this much in 2021 fell into poverty at least once between 2022 and 2023.

The middle class in Tajikistan has been expanding, particularly in the post-COVID-19 period

Tajikistan experienced a gradual expansion in the middle class in the pre-COVID-19 period, which significantly accelerated post-pandemic. As the country made notable progress in reducing poverty in the previous decade up to 2020 (Panel a of Figure 2), the share of the vulnerable population initially increased, leading to a relatively small and stagnant middle class. The middle class grew from a low 8 percent in 2010 to 16 percent in 2020. During the 2021–2024 period, both poverty and the share of the vulnerable population decreased (Panel b of Figure 2), as the middle class started to expand more rapidly from 24 to 33 percent. These findings indicate a stronger poverty reduction and accompanied by continued upward mobility in Tajikistan.

Figure 2. Trend of the poor, vulnerable, and the middle class in Tajikistan, 2010–2024



Source: World Bank staff calculations based on the HBS 2010–2024.

Notes: The results for 2010–2020 are based on back-casted data using the HBS.

The middle class in Tajikistan have better human capital, labor market resources, and access to resource hubs

Middle-class households in Tajikistan enjoy higher labor market resources, greater asset ownership, and less exposure to weather shocks compared with lower-class households, implying significant economic stability and resilience. Middle-class households in Tajikistan typically have smaller family sizes and fewer dependents (Table 1). They tend to have members with higher levels of education and better employment rates compared with lower-class households, suggesting better labor market resources and human capital. They are more likely to be employed in the private sector and hold medium- to high-skilled jobs. Remittances play a significant role in their livelihoods and they appear to be owners of durable assets. They live in areas less exposed to weather-related shocks and in proximity to resource hubs such as markets, enhancing their resilience. In contrast, lower-class households face more significant challenges, with larger family sizes, lower levels of education, fewer employment opportunities, lower tendency to own durable assets, and greater dependency on agriculture, making them more vulnerable to economic and environmental shocks.

Table 1. Profile of economic classes

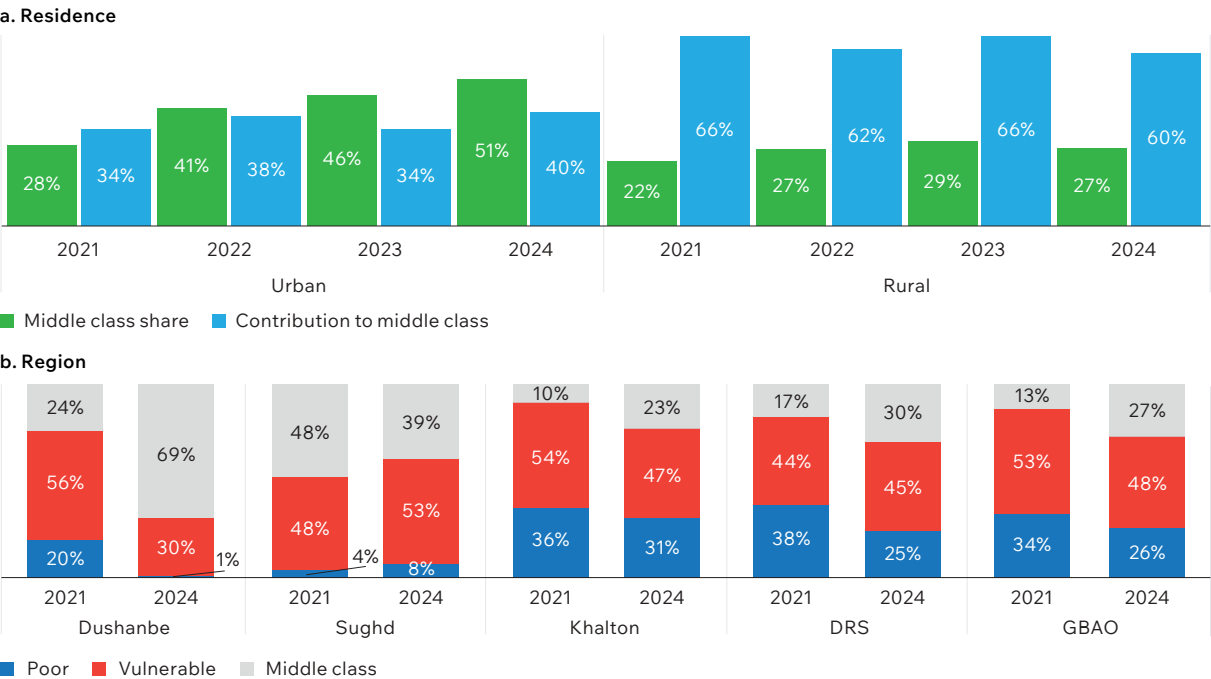
	Poor	Vulnerable	Middle class
Demographics:			
Head age (years)	56.1	57.3	57.4
Female headed	16%	22%	28%
Age dependency ratio	79.9	82.1	67.9
Household size	6.9	7.0	6.3
Education:			
Members with no education	30%	16%	4%
Members with primary education	15%	16%	16%
members with secondary education	49%	58%	65%
Members with post-secondary education	6%	10%	14%
Labor market:			
Employment (working age)	29%	41%	51%
Employment in high skill occupation	16%	15%	18%
Employment in medium skill occupation	43%	56%	54%
Employment in low skill jobs	40%	28%	27%
Employment in private sector	31%	42%	54%
Housing:			
Inadequate housing materials (floors/walls)	49%	40%	31%
Improved sanitation	94%	94%	90%
Safe drinking water	86%	88%	88%
Electricity access	71%	74%	76%
Assets:			
Mobile phone	88%	91%	92%
Television	77%	86%	92%
Refrigerator	52%	65%	77%
Car/truck	11%	20%	32%
Stove/oven	72%	82%	89%
Washing machine	20%	34%	54%
Weather shock and market access:			
Drought (frequency)	14.5	13.9	12.5
Heat stress experience	19%	17%	9%
Distance to nearest main market (Km)	26.2	23.4	21.5

Notes: Labor market statistics is based on HBS 2022, and other descriptive statistics are based on HBS 2023.

Middle-class expansion in Tajikistan is strongest in urban areas, although rural areas have a higher contribution

The rise of the middle class is mainly an urban trend. In urban Tajikistan, the middle class grew from 28 percent in 2021 to 51 percent in 2024 (Figure 3). The middle class in rural areas also expanded, but by only 5 percentage points from 22 to 27 percent during the same period. However, due to their high population share, rural areas make up about sixty percent of the middle class in 2024. There is notable regional heterogeneity in the size and expansion of the middle class. The Sughd region had the highest middle-class share in 2021 (48 percent) dropping to 39 percent in 2024, while in Dushanbe it increased from 24 to 69 percent. The Khatlon region and the DRS saw considerable growth from a low base in 2021, to a 13- percentage-point increase in 2024, whereas the share in the GBAO region increased by 14 percentage points during the same period.

Figure 3. Distribution of economic classes by residence and region, 2021–2023



Source: World Bank staff calculations using the HBS 2021–2023.

There is a significant upward mobility across economic classes

There is gradual progression of households across socio-economic classes, exhibiting substantial path dependence. A class-mobility matrix of class position between 2021 and 2023 shows a high persistence of class and notable mobility across classes (Table 2). For instance, most households that escaped poverty (57 percent) moved into the vulnerable category (45.5 percent), while those in the vulnerable category either remained there (56 percent) or attained a middle-class status (30 percent). Some of the poor (11 percent) and a significant share of the vulnerable (30 percent) climbed into the middle class. About 72 percent of the middle class in 2021 stayed in the middle class in 2023, while 26 percent fell into the vulnerable group. There is some resilience to falling into poverty, with just 14 percent of households in the vulnerable category

Table 2. Economic class mobility in Tajikistan, 2021 – 2023

		2023		
		Poor	Vulnerable	Middle class
2021	Poor	43	45	11
	Vulnerable	14	56	30
	Middle class	2	26	72

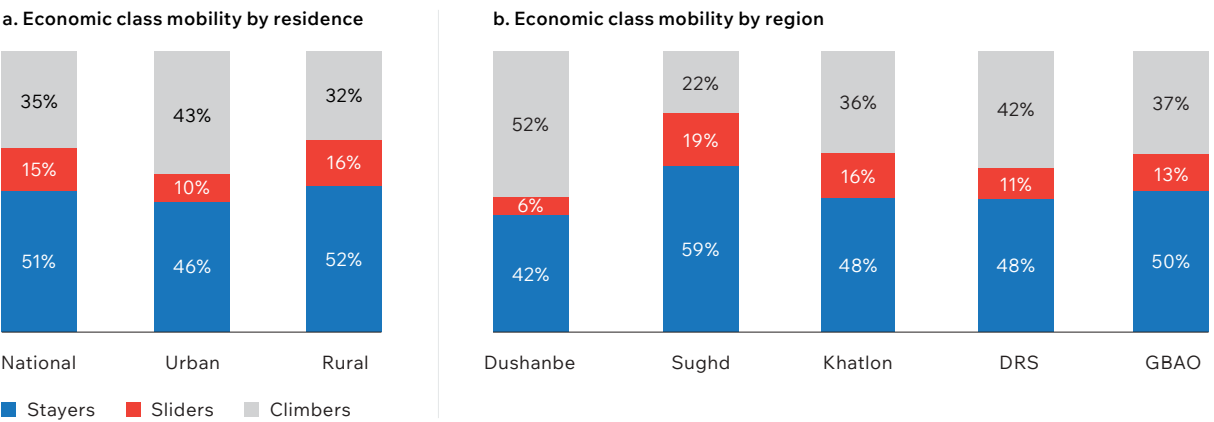
Source: World Bank staff calculations based on the HBS 2021 and 2023.

in 2021 finding themselves poor again in 2023. Overall, the findings indicate that the middle class has a negligible probability of falling into poverty (2 percent), sustaining the claim that middle-class upward mobility provides an almost certain insurance against economic deprivation.

There is significant economic class mobility in Tajikistan, with many households moving up the economic class ladder, while a considerable portion of the population slide into lower classes. Categorizing the possible transitions into three groups based on class mobility between 2021 and 2023 — stayers, sliders, or climbers — 51 percent of the households stayed in their initial economic classes, 35 percent moved up, and 15 percent moved down into lower class (Panel a of Figure 4). This suggests significant upward mobility due to escaping poverty and joining the middle class, while downward mobility is mostly from middle class to vulnerable or

from vulnerable class to poor. Spatial heterogeneities exist in economic class mobility: rural areas experienced higher downward mobility and less upward mobility than urban areas. The Sughd region shows higher downward mobility and less upward mobility, while Dushanbe has the highest upward mobility and lowest downward mobility (Panel b of Figure 4). The observed trends are consistent with the overall pattern of strong poverty reduction and smaller increase in inequality in urban areas, and could be due to differing economic opportunities and dynamics of the labor market.

Figure 4. Share of people moving across economic classes by residence and region, 2021–2023



Source: World Bank staff calculations based on the HBS 2021 and 2023.

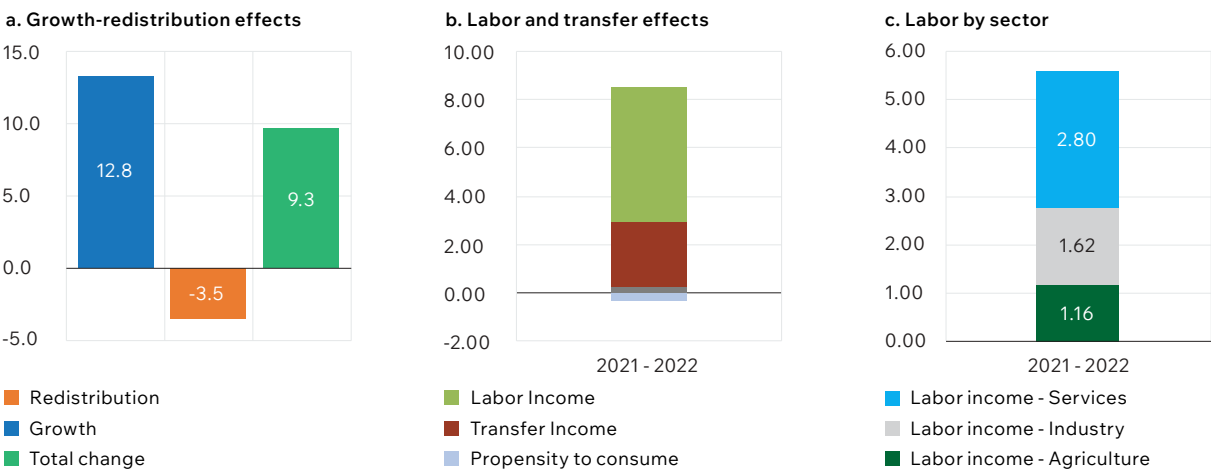
Notes: Reduced categorization of economic classes transitions: (i) stayers: if stayed poor, vulnerable, or middle class; (ii) sliders: if moved to lower class – from vulnerable to poor or from middle class to vulnerable or poor; or (iii) climbers: if moved from poor to vulnerable or middle class and from vulnerable to middle class.

2. Drivers of Middle-Class Growth and Economic Mobility

Private transfers and labor income are main contributors of middle-class growth

Labor income and transfers have contributed to growth in the middle class. Datt-Ravallion decomposition results show that growth contributed 12.8 percentage points to the growth in the middle class during 2021–23 period, while redistribution had a negative effect, offsetting the middle-class expansion by 3.5 percentage points (Panel a of Figure 5). Results from Shapley decomposition show that labor income and transfers are primary drivers of middle-class growth (Panel b of Figure 5), respectively contributing 5.6 percentage points (or 68 percent) and 2.7 percentage points (or 33 percent) to the expansion of the middle class. Their contribution to middle-class growth was partially offset by a small increase in the savings rate. Within transfer income, private transfers contribute the most (25 percent) to middle-class growth. The results indicate that transfers had a greater impact on middle-class growth compared with poverty reduction (as a share of the total), while the contribution of labor income was slightly less.

Figure 5. Drivers of middle-class expansion: Shapley decomposition



Source: World Bank staff calculations based on the HBS 2021–2023.

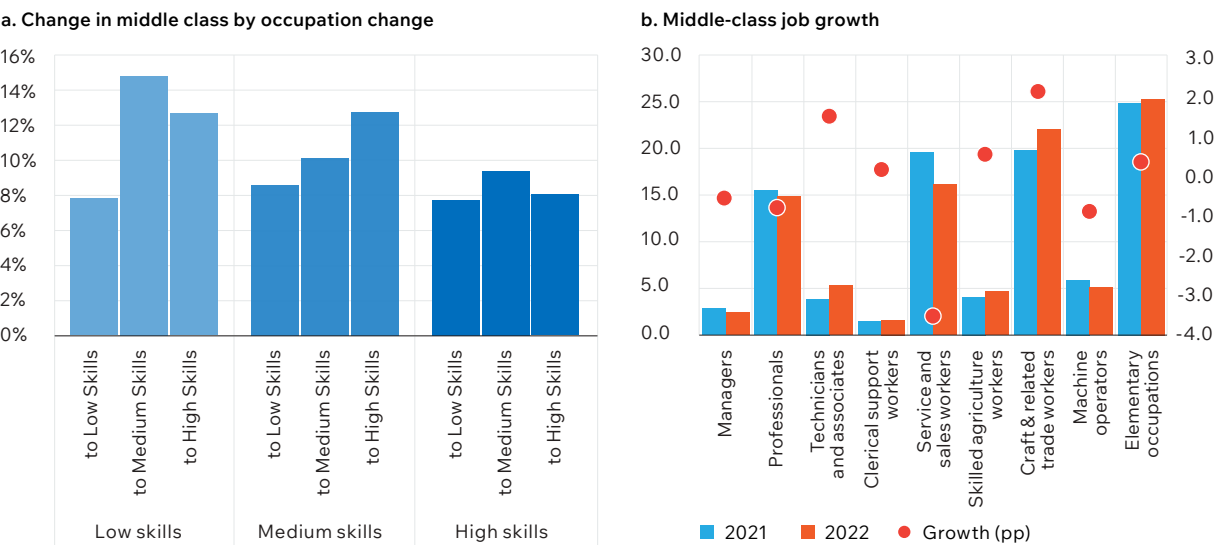
Notes: Panel a displays results from the Datt-Ravallion decomposition (2021–2023), while panels b and c present results from Shapley decomposition by income components and labor by sector (2021–2022), respectively.

Labor income from the services sector is the most significant contributor, followed by labor income from the industry sector. Further disaggregation of the contribution to middle-class growth of labor income shows that labor income from the services sector contributes the most to middle-class growth, at 2.8 percentage points (34 percent), comprising half of labor income’s contribution (Panel c of Figure 5). Labor income from industry contributes 1.6 percentage points (20 percent) to middle-class growth, or 29 percent of labor income’s contribution. While employment in the agriculture sector was an important factor for poverty reduction (see Chapter III), employment in the non-agriculture sector appears to be more effective in promoting middle-class growth in Tajikistan.

Better labor market outcomes increase the likelihood of entering and maintaining the middle-class status mediating the influence of shocks

Labor mobility into medium- and high-skilled occupations, away from agriculture, and out of the country is the key determinant of transition into middle-class status. Results from a multinomial logit model of joining a middle class and middle-class stability (Figure 6) show that households with heads employed in industry or services, particularly in high- or medium-skilled jobs, are more likely to achieve and maintain middle-class status. More importantly, occupation transitions from low- to medium- or high-skilled jobs have significant contribution to middle-class growth (Panel a of Figure 6). Households that made a progressive transition into medium- or high-skill jobs saw an increase of more than 13 percentage points in the middle-class share. In contrast, households that stayed in or made a regressive transition to low-skill occupations experienced a less-than-10-percentage-point increase.

Figure 6. Growth in middle class by occupation transitions and middle-class jobs growth



Source: World Bank staff calculations based on the HBS 2021 and 2022.

Notes: Panel a shows the percentage change in the middle class (2021 to 2022) by occupation transition of the head. Panel b shows the head's occupation and job growth within it for middle-class households. High-skilled jobs: managers, professionals, and technicians and associate professionals; low-skilled jobs: elementary occupations. Military personnel are not classified by skill. Other occupations are medium skill.

However, growth of high-skilled jobs associated with the middle class remains limited. Employment in managerial roles is low overall and stagnant from 2021 to 2022 (Panel b of Figure 6). High-skill jobs are largely dominated by occupations such as professionals, but their growth during this period is very low. An exception is the technician and associated professionals' occupation, which saw a growth of 1.6 percentage points despite their overall low prevalence. The most notable growth in middle-class jobs is in medium-skilled crafts (and related) and skilled agricultural work.

Education matters for ensuring middle-class stability, while its correlation with joining the middle class is less pronounced. Post-secondary education is positively correlated with middle-class stability but not with joining the middle class (Figure 7). This effect may reflect a household's social capital and access to resources that could reduce vulnerability. Furthermore, higher education achievement could affect economy mobility by equipping individuals with skills necessary for upward occupational transitions. Households with members who have attained

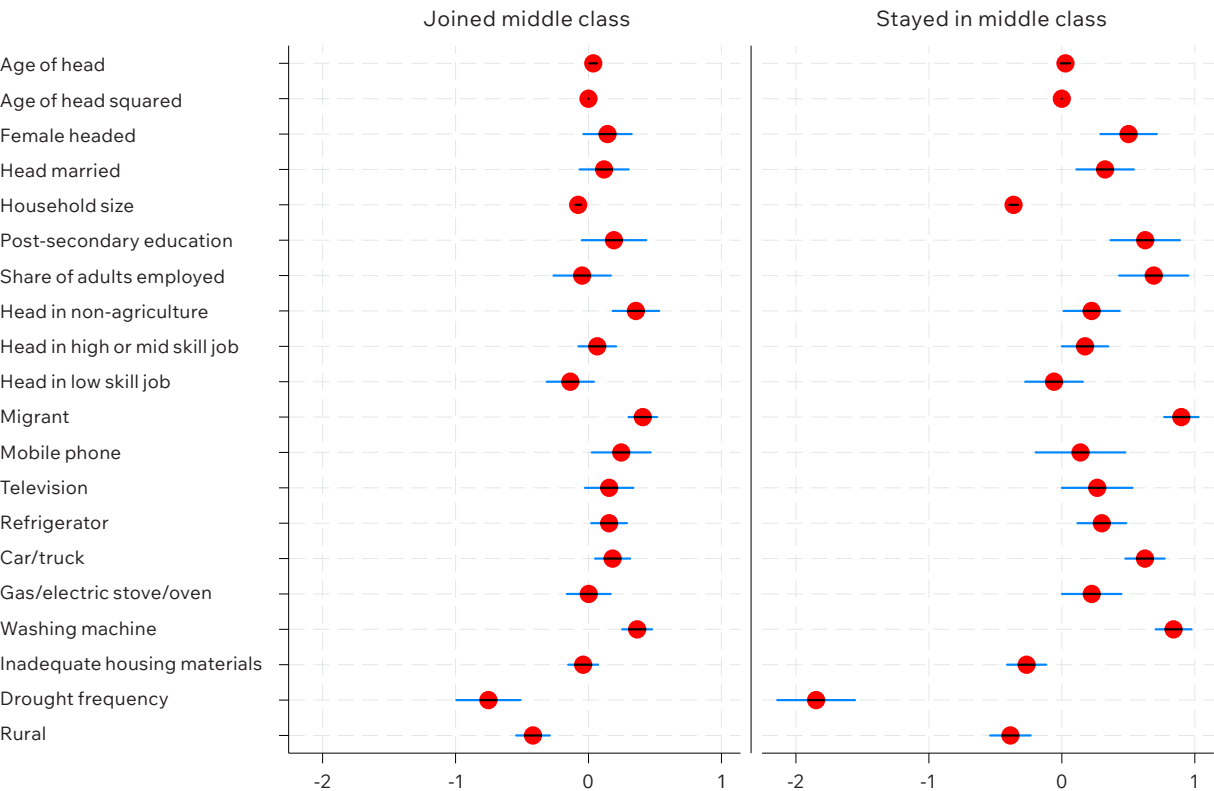
higher education levels are more likely to secure medium- and high-skilled jobs, which are pivotal for sustaining middle-class status. The importance of education is further underscored by its role in mitigating the adverse effects of economic shocks.

Migration is associated with better prospects of both joining and remaining in the middle class.

This underscores the importance of remittances for economic advancement and upward mobility. Remittances sent by migrants provide crucial financial support for families in the place of origin, enabling investment which is key factor for upward socio-economic mobility. Furthermore, the growing middle class in Tajikistan is driven by private transfers which exemplifies the significant impact of international labor migration and external financial flows.

Demographic factors influence joining and staying in the middle class. After controlling for occupational resources and change in labor-market standing, the probability of joining a middle class increases then decreases with age (Figure 7). Female-led households (mainly widowed, at 77 percent) are more likely to maintain their middle-class status. This finding somehow challenges the conventional wisdom that associates higher levels of poverty and vulnerability with female-led families due to potential reliance on a single income source and the difficulty of balancing household and labor market responsibilities (Torche & Lopez-Calva, 2013). Households with married heads are more likely to stay in the middle class, potentially due to higher human capital and occupational resources associated with married couples. Household size is negatively correlated with both joining and staying in the middle class, primarily due to larger share of dependents.

Figure 7. Determinants of economic class mobility



Source: World Bank staff calculations based on the HBS 2021, 2022, 2023.
Notes: Figure plots the average marginal effects estimates obtained using a multinomial logit model of economic class mobility. The analysis is based on reduced categorization of economic classes transitions and a balanced sample. The reference category is staying poor or vulnerable in both periods (2021 and 2023). Results remain consistent with additional control variables such as occupational change, change in number of adults employed, and change in household size.

Chapter V. Structural Transformation at Home and Overseas

Deep Dive

Chiyu Niu | Alisher Rajabov | Jin Yao | Zuhro Qurbonova



Photo: The World Bank Tajikistan Country Office Photo Collection.

Abstract

From 2010 to 2023, Tajikistan's poverty reduction and middle-class growth were to a large extent, fueled by jobs created abroad — not at home. Labor migration to the Russian Federation drove structural transformation in employment, while the domestic economy had jobless growth, especially in industry. At home, the economy remains in the crop diversification stage — an early phase of structural transformation. At the subnational level, when structural transformation in employment occurred, it brought more people out of poverty and into the middle class than value-added growth. However, too many of these jobs are in the public sector, which is unsustainable due to heavy reliance on the state budget. For long-term prosperity, Tajikistan needs to kick-start transformation at home by strengthening agriculture as a springboard for resilience, productivity, and upward mobility — laying the foundation for a self-sustaining middle class.

Structural transformation and poverty reduction in Tajikistan

Structural transformation refers to the long-term shift of an economy's employment and production (in terms of value added) patterns from low-productivity sectors, such as agriculture, to higher-productivity sectors, such as industry and services. This process is a key driver of economic growth, poverty reduction, and improvements in living standards. Several nations have experienced significant economic growth through structural transformation. Japan's post-World War II "economic miracle" saw rapid industrialization and technological advancement, propelling it to become the world's third-largest economy by the 1960s. The Republic of Korea transformed from a war-torn nation into a G20 economic powerhouse by emphasizing innovation and industriousness, leading to robust growth over five decades. Vietnam's Đổi Mới reforms in the 1980s transitioned the country from a centrally planned economy to a socialist-oriented market economy, resulting in significant GDP growth and poverty reduction. China's "Reform and Opening Up" policies initiated in 1978 led to rapid economic expansion, transforming it into a global economic leader.

However, previous chapters suggest that the labor income gains driving poverty reduction and middle-class expansion in Tajikistan were not the result of significant shifts in labor across sectors. Despite the critical role labor income played—accounting for 73 percent of recent poverty reduction—this was largely due to rising wages within existing jobs, rather than job creation. The middle class expanded from 24 to 33 percent between 2021 and 2023, primarily through increases in labor income from services and industry, as well as remittance transfers, rather than through large-scale sectoral labor shifts. What could explain this pattern? Could it be other forms of transformation within sectors, such as productivity gains, higher returns to labor in specific occupations, or increased wage differentials? Or could it be transformation through labor migration?

Tajikistan lacks structural transformation at the national level, exhibiting jobless growth.

Macroeconomic data show minimal structural transformation in employment, at the national level, despite high growth in some sectors, which is consistent with the lack of income source shifts observed in survey data. The share of agricultural value added in the economy has remained at around 25 percent over the past decade. Non-construction industry has grown since 2014 but stabilized post-pandemic, similar to the construction sector. Services value added has decreased by 10 percentage points over the past 15 years, from 47 to 37 percent (Figure 1). Employment structures have shown no significant change for almost 20 years. The share of industrial jobs in the economy has become relatively less small compared with agriculture and services jobs, even as industry's share in GDP expanded. About 61 percent of jobs are in agriculture, 30 percent in services, 5 percent in non-construction industry, and 4 percent in construction (Figure 2). Therefore, labor has not shifted to the fastest growing parts of the economy.

Figure 1. Structural transformation in value added

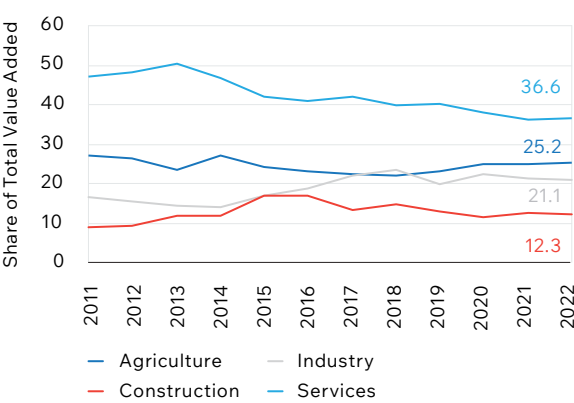
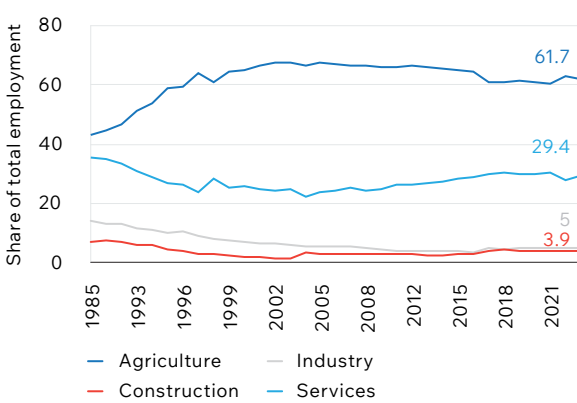


Figure 2. Structural transformation in employment



Source: World Bank staff calculations and the Tajstat.

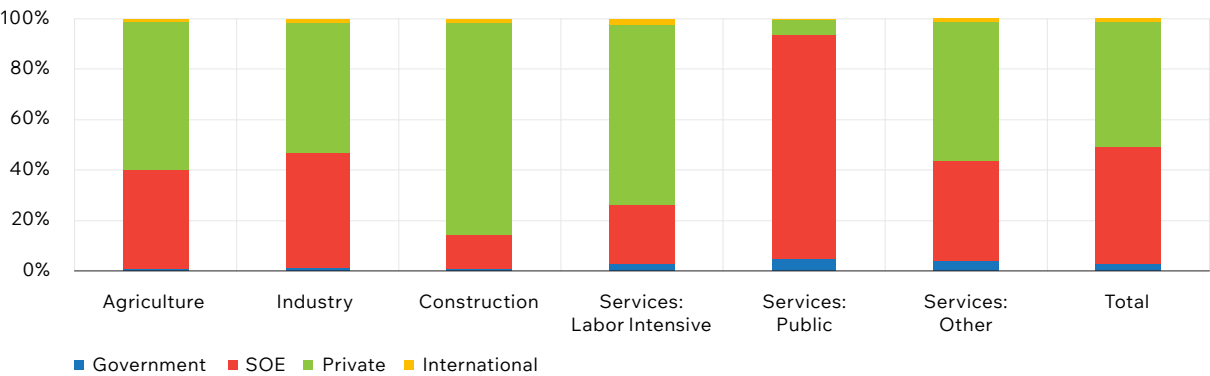
Indeed, Tajikistan’s domestic economy had jobless growth as private sector dominant sectors stagnated. Between 2013 and 2023, industrial GDP share grew by 6.7 percentage points, whereas the sector’s job share increased by less than 1 percentage point. Instead, the public services sector — encompassing education, health, and public administration — has been the main source of job creation but without corresponding growth. The proportion of jobs created in the public services sector increased by 2.3 percentage points, although its contribution to value added decreased by 1.1 percentage points (Figure 3). Nearly half of all jobs (47 percent) are in state-owned enterprises (SOEs) or government sectors (Figure 4). Sectors where private enterprises dominate — such as labor-intensive tradable services (72 percent private) and construction (84 percent private) — have experienced either declining value added or minimal growth in recent years. The labor-intensive tradable services sector, which includes retail, wholesale, transportation, catering, and hotels, often contributes significantly to poverty reduction. This sector’s contribution to the economy has been declining over time with minimal job creation. This represents a missed opportunity for both poverty reduction and middle-class expansion. This imbalance reflects a structural bias toward SOE and public sector activities, which typically offer limited potential for broad-based job creation compared with dynamic private sector-led industries.

Figure 3. Percentage changes in the share of value added and employment from 2013 to 2023



Source: World Bank staff calculations and the Tajstat.

Figure 4. Employment composition by type of employer in 2022



Source: World Bank staff calculations based on HBS.

There has been some structural transformation at the subnational level, which contributed to poverty reduction and middle-class growth.

At the subnational level, certain regions have shown structural transformation in value added and employment, closely linked to poverty reduction and middle-class growth. The Tajstat provides data on value added and employment across regions, such as Dushanbe, the Sughd region, the DRS, and the Khatlon and GBAO regions. By comparing these regions and their economic structures over time, structural transformation episodes can be identified. For instance, the DRS saw a rise in non-agricultural employment from 77 percent in 2011 to 92 percent in 2022 (Figure 5). Although Sughd experienced less structural transformation (Figure 6), it has a lower share of non-agricultural employment (43 percent in 2022) compared with the DRS (92 percent in 2022).

Figure 5. Structural transformation and poverty trend in the DRS

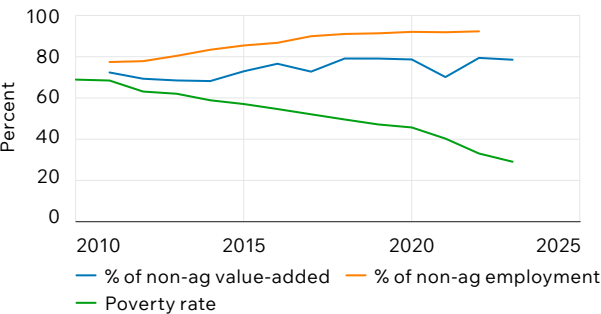


Figure 6. Structural transformation and poverty trend in Sughd

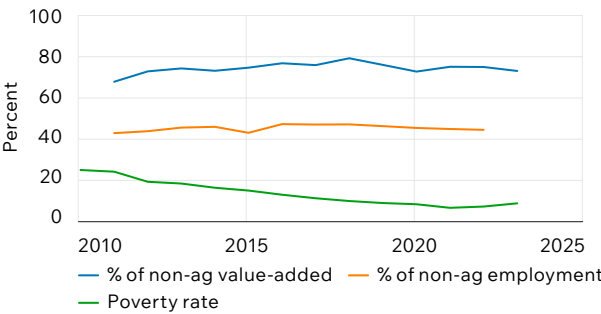


Figure 7. Structural transformation and poverty trend in GBAO

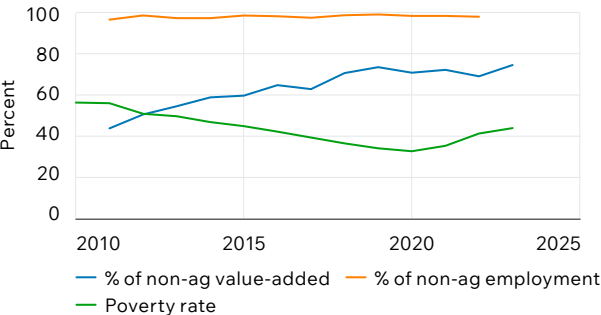
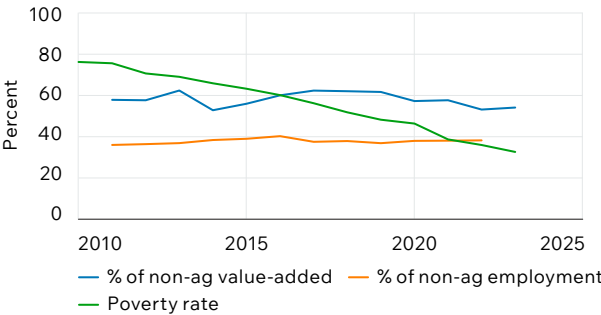


Figure 8. Structural transformation and poverty trend in Khatlon



Source: World Bank staff calculations and the Tajstat.

Subnational structural transformation has been closely linked to poverty reduction and middle-class expansion, though through different mechanisms. Evidence suggests that structural transformation in employment is what matters most for reducing poverty than just transformation in sectoral output. Thus, increased employment in non-agricultural sectors is the key to poverty alleviation. As illustrated in Table 1, the model of structural transformation on poverty reduction reveals that a 1-percentage-point increase in value added by domestic non-tradable services leads to a 1.7-percentage-point reduction in poverty. However, this impact is considerably less significant compared with the effect in the same sector but in terms of employment, which leads to a 4-percentage-point reduction in poverty. Sectors such as non-manufacturing industries and nearly all services sector jobs have shown strong correlations with regional poverty reduction.

Middle-class growth is tied to state-dominated sectors such as resource extraction and public services. Of all factors contributing to structural transformation, the creation of jobs in non-manufacturing sectors, such as mining and hydro resources, has the most substantial impact on the expansion of the middle class. A 1-percentage-point increase in jobs in the mining and hydro resources sector corresponds to a 3.5-percentage-point rise in the share of the middle class. In addition, employment opportunities in public services sectors, including education, healthcare, public administration, and defense, are associated with middle-class growth. These sectors, recognized as drivers of middle-class expansion, are characterized by significant state involvement.

Table 1. Fixed effects model relating ST with poverty reduction and middle-class expansion

Variables	Poverty reduction	Middle-class expansion
VA in manufacturing	-0.120	0.776
VA in non-manufacturing	0.105	0.627
VA in finance	-0.395	-1.431
VA in retail, hotel, transport	-0.493*	-0.888
VA in domestic non-tradable services	-1.738***	1.681*
VA in public services	-0.135	-1.299
Jobs in manufacturing	-3.186**	-0.867
Jobs in non-manufacturing	-1.474***	3.505**
Jobs in finance	2.101	-4.276
Jobs in retail, hotel, transport	-3.874***	2.236
Jobs in domestic non-tradable services	-4.000***	-0.452
Jobs in public services	-1.707***	1.769*

*** p<0.01, ** p<0.05, * p<0.1

Notes: Estimates based on panel data at the regional level from Tajikistan yearbooks. Fixed effect regression is applied to control for time-invariant unobserved heterogeneity. Dependent variables are poverty rate and share of middle class, respectively. Variable column in the table are key independent variables, which include ST in value added and employment. Other control variables include total value added, total employment, climate shocks, and time trend.

Subsector classification: Manufacturing includes processing industry; non-manufacturing includes mining and quarrying, electricity, gas and water supply, and construction; ICT and finance includes financial intermediation and insurance; retail, hotel and transport subsector includes wholesale and retail, repair of automobiles and motorcycles, hotel and restaurants, and transport, warehousing and communication; domestic non-tradable services include real estate, entertainment and recreations, other communal, social and personal services, and households and extraterritorial organizations and social services; public services include education, health, public administration, defense and mandatory social insurance.

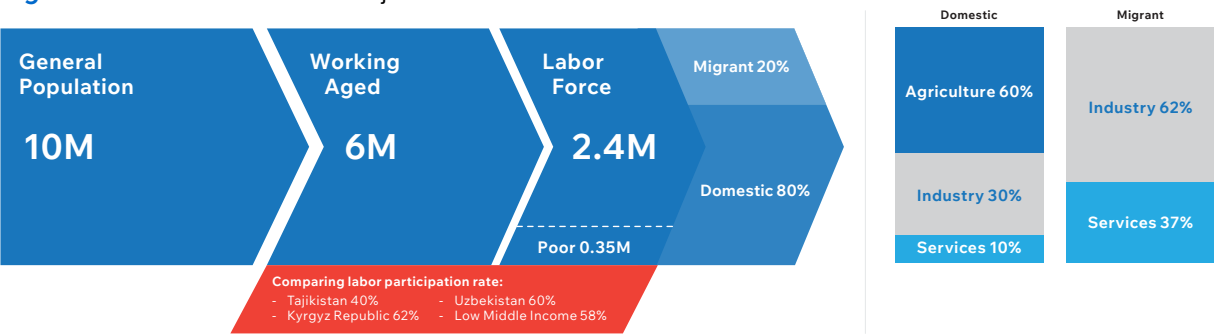
Tajikistan outsourced some of its structural transformation

Tajikistan’s strong economic growth and poverty reduction stem not from domestic structural transformation but from migration-driven income gains.

Structural transformation follows a natural sequence. Based on economic world history, structural transformation begins with agricultural modernization, where productivity in staple crops improves through better farming techniques, mechanization, and higher-yield seeds, reducing the labor needed for subsistence farming. As productivity rises, farmers shift to crop diversification, growing higher-value products such as fruits, vegetables, and cash crops, which increase incomes and create new market opportunities. This transition enables labor to move into industrialization, where jobs in manufacturing, construction, and trade expand, driving urbanization and wage growth. Over time, economies progress to a service-led phase, where finance, technology, and high-skilled services dominate, ultimately leading to diversified, high-productivity growth with a balanced mix of industry and services, sustaining long-term prosperity and a strong middle class. Based on Tajikistan’s macroeconomic indicators, the country seems to have diverged from this standard growth trajectory. But is this really the case?

The answer is no, because structural transformation occurred indirectly through labor migration to the Russian Federation, rather than within Tajikistan’s domestic economy, which experienced jobless growth. Figure 9 illustrates the labor resources of Tajikistan. Out of a population of 10 million, there are 6 million individuals within the working age range of 15 to 64 years, as defined by the International Labor Organization. However, only 2.4 million, or 40 percent, of this working-age population is part of the labor force, either employed or actively seeking employment — the lowest in Central Asia and among lower middle-income countries.¹ Among the 3.6 million working-age but inactive population, 1.8 million are not in school, of which 1.3 million are females. Within the 2.4 million-strong labor force, about 20 percent are labor migrants, achieving employment through migration, with over 90 percent working in the Russian Federation, while the majority of the remaining workforce is engaged in domestic employment, primarily in the agriculture sector. Despite the interruption of flights and decline in labor migration at the onset of the COVID-19 pandemic in 2020, the proportion of labor migrants has remained above 20 percent, even during Russia’s invasion of Ukraine. More than 98 percent of migrant employment is concentrated in non-agricultural sectors. If these migrant positions are regarded as contributing to Tajikistan’s economy, it implies substantial structural transformation has occurred within the framework of the Russian Federation’s economy.

Figure 9. Labor resources in Tajikistan



Source: World Bank staff calculations based on HBS 2022.

¹ One of the most significant differences between Tajikistan and its peers is its low labor force participation rate of 40 percent, in contrast to the Kyrgyz Republic’s 62 percent, Uzbekistan’s 60 percent, and an average 58 percent in lower middle-income countries.

The current phase of domestic structural transformation is still in its early stages within agriculture

Box 1. Identification of the stage of structural transformation

To identify the drivers initiating domestic structural transformation, we need to understand its current phase. This is because structural transformation progresses naturally, rarely experiencing sudden or significant advances. This can be achieved by modeling the extent of structural transformation, proxied by the share of employment in the non-agricultural sectors, and associate this with variables representing different stages of structural transformation, such as agricultural productivity of staple crops, crop diversification, and urbanization. In addition, it is important to control for factors that also influence structural transformation, such as education and natural disasters, which tend to impact structural transformation through agriculture. This analysis is undertaken at the subnational level with administrative data from the Tajstat on crop yields and production values, urbanization rates, educational resources such as schools on different levels, and natural disasters such as droughts.

Structural transformation in Tajikistan remains at an early stage, marked by productivity growth in non-staple crops within the structural transformation spectrum. However, droughts significantly impede progress in structural transformation. Value-chains of high-value crops drive growth in non-agriculture jobs within the agri-food system. As shown in Table 2, a 1-tonne per hectare increase in yields in fruit and berry products is associated with a 1.77 percent increase in non-agriculture employment — an early stage of structural transformation improving non-staple crop yield. However, crop diversification, indicated by the share of non-staple crop production values, and urbanization indicators do not show strong associations with structural transformation. Droughts, which are recognized as a frequent and localized natural disaster in Tajikistan, hinder the structural transformation process, particularly during its agricultural phase.

Table 2. Fixed effects model that indicates the current stage of structural transformation

Variables	ST in employment	Variables	ST in employment
Yield of grain and leguminous crops	0.00332	Number of general education schools	-0.0518
Yield of vegetable	-0.000232*	Number of students in general education schools	0.0801***
Yield of fruit and berries	0.00177**	Number of special technical schools	0.0608
Total production of crops	-0.0152	Number of students in special technical schools	0.374*
Crop diversification	0.0625	Drought	-3.264**
Share of urban population	-0.323		

*** p<0.01, ** p<0.05, * p<0.1

Notes: Estimates based on panel data at regional level from Tajikistan yearbooks. Fixed effect regression is applied to control for time-invariant unobserved heterogeneity. Dependent variable is ST in employment (share of non-agricultural employment). Independent variables include yield of three types of crops (representing agricultural productivity), crop diversification as the share of non-staple crop production in total crop production, share of urban population (representing rural-to-urban migration), number of schools and students in general education and special technical education (representing human capital), and drought (representing climate shocks).

Conclusion

Tajikistan's structural transformation story is one of paradoxes and potential. Unlike many economies where transformation occurs domestically, Tajikistan's poverty reduction and middle-class growth have been driven largely by labor migration to the Russian Federation, rather than through job creation at home. While subnational trends reveal pockets of transformation linked to poverty reduction, the national economy remains in an early-stage transition, heavily reliant on agriculture and state-driven employment. Evidence underscores that employment growth in non-agricultural sectors is more effective in reducing poverty than mere shifts in sectoral value added, highlighting the need for domestic job creation beyond the public sector. To unlock sustainable growth, Tajikistan must strengthen its agricultural base as a steppingstone toward industrialization and services sector expansion, fostering a self-sustaining middle class. The country is not an exception to the structural transformation pathway, but rather a unique case where migration has substituted for internal economic diversification. Going forward, fostering domestic transformation will require strategic investments in productivity, human capital, and business-friendly policies to create high-quality, sustainable employment opportunities at home.

Chapter VI. Poverty and Distributional Implications of Climate Change in Tajikistan

Deep Dive

Alisher Rajabov | Sinafikeh Asrat Gemessa | Tawanda Chingozha



Photo: The World Bank Tajikistan Country Office Photo Collection.

Abstract

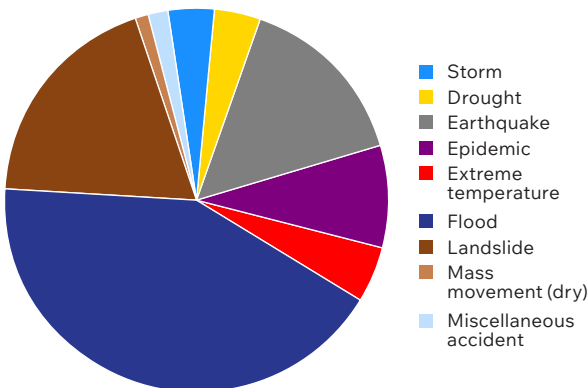
Tajikistan is highly susceptible to climate risks, primarily due to its substantial rural population reliant on irrigated agriculture, together with its mountainous landscape. Despite more frequent occurrences of floods compared with droughts, the country is projected to experience temperature rises significantly above the global average. Climate change impacts are greatest on local rural communities in Tajikistan, particularly given the degrading landscape, and very low water productivity, with high withdrawals for agriculture and significant losses during conveyancing and use. Drought also poses a significant threat to agricultural livelihoods in Tajikistan, and districts at a high risk of drought are often those also suffering from high poverty rates, while the Sughd region has higher exposure to flood risks. The adverse impacts of climate change are not only limited to the bottom deciles of the population in terms of income or consumption levels, but are also expected to impact relatively well-off households in the form of disruptions to their livelihoods because of climate change-induced shocks.

Tajikistan’s high vulnerability to climate change

The effects of climate change could significantly reduce Tajikistan’s growth

Tajikistan is highly susceptible to climate risks, primarily due to its substantial rural population reliant on irrigated agriculture, together with its mountainous landscape. Natural disasters, including floods and landslides, are significant risks for Tajikistan (Figure 1). A recent World Bank assessment (Tajikistan Country Climate and Development Report 2024) shows that these events could reduce the country’s GDP per capita by 5–6 percent. Tajikistan is ranked 98th out of 185 on the 2021 Notre Dame Global Adaptation Initiative (ND-GAIN) Index,¹ reflecting its significant vulnerability to climate change.

Figure 1. Average annual natural hazard occurrence, 1990–2020



Source: World Bank Climate Change Knowledge Portal.

About 71 percent of Tajikistan’s population resides in the countryside and depend on agriculture for sustenance. This creates food security (consumption) challenges given farming’s vulnerability to climate change. Rising temperatures and altered precipitation patterns pose threats to water resources and agricultural lands, potentially leading to heightened competition for shared resources, increased fragility and cross-border conflicts (World Bank, 2024).

Despite more frequent occurrences of floods compared with droughts, the country is projected to experience temperature rises significantly above the global average. There is

a high likelihood that temperatures in Tajikistan will more regularly surpass 40°C, particularly in lowland regions, for example the Khatlon region. Increased temperatures, paired with increased

1 The ND-GAIN Index Score (out of 100) summarizes a country’s vulnerability to climate change and other global challenges in combination with its readiness to improve resilience. It aims to help businesses and the public sector better prioritize investments for a more efficient response to the immediate global challenges ahead.

likelihoods for aridity and drought incidence, can cause the expansion of arid land for some areas, which could also affect agricultural yields. Latest climate data show that annual average surface air temperature has risen from about 3 °C to 5 °C over the past 40 years (World Bank, 2021). Tajikistan has also very low water productivity, with high withdrawals for agriculture and significant losses during conveyancing and use. Water use in irrigated agriculture is particularly wasteful, with irrigation efficiencies often not more than 30 percent, primarily due to deteriorated conditions of irrigation infrastructure (World Bank, 2017). Shrinking glaciers and snow-cover further reduce water availability. This decline has impacted water supply, especially in the summer when irrigation is critical.

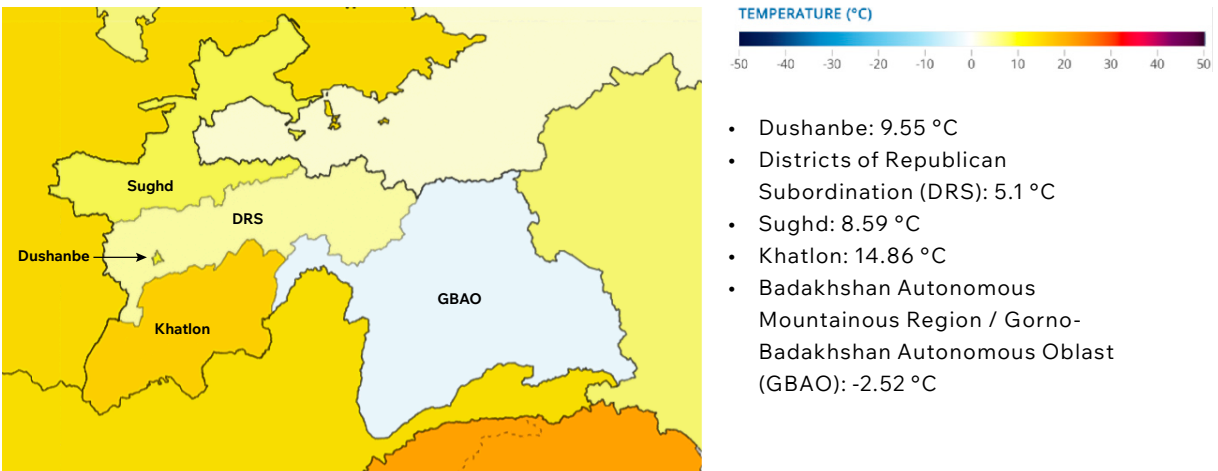
Degraded landscapes contribute to vulnerability to natural disasters. Tajikistan is already heavily impacted by landslides and experiencing higher-than-average temperatures. Degraded landscapes around cities such as Dushanbe, Bokhtar and Kulob contribute to these cities' vulnerability to natural disasters and extreme events. This degradation also exacerbates the urban heat problem, which is further intensified by air pollution due to the loss of ecosystem services provided by natural vegetation affected by industrial pollution.

Incidence of climate shocks by welfare and location

Droughts are more prevalent in districts with high poverty rates, while floods tend to pose a greater risk in less impoverished districts with larger populations.

Climate change impacts are greatest on local rural communities in Tajikistan. Historical data show that the Khatlon region has the highest average surface air temperature among the regions of Tajikistan (Figure 2). A 2021 World Bank survey shows that 80 percent of rural respondents reported irregular temperatures, 66 percent noted irregular rainfall, and 47 percent had experienced a natural disaster in the past two years (World Bank, 2024). Women, women-headed households, and youth are particularly vulnerable due to their more limited resources for adaptation.

Figure 2. Observed annual average surface air temperature, 1991–2020

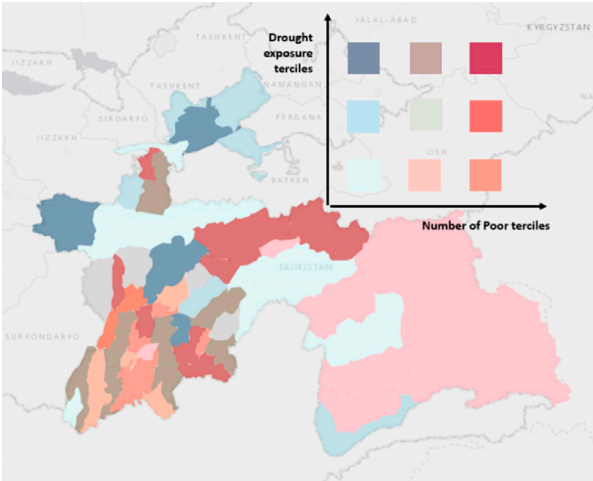


Drought also poses a significant threat to agricultural livelihoods in Tajikistan. In a one-in-40-year drought scenario, about one-third of districts, particularly in the Khatlon region, could experience severe impacts, with more than 34 percent of their populations affected. This suggests that drought-like conditions could severely affect at least half of the country's agricultural land.

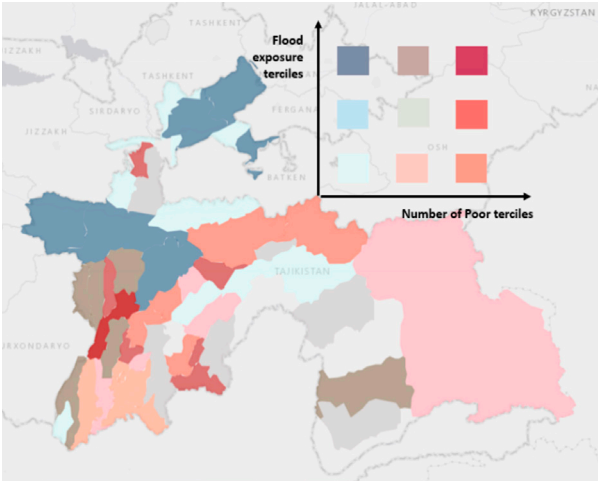
Districts at a high risk of drought are often those also suffering from high poverty rates, while the Sughd region has higher exposure to flood risks (Figure 3). These high-risk districts are found in the low-density GBAO region and the high-density DRS and the Khatlon region. Many of the highly vulnerable districts overlap with those facing significant drought risk. Despite generally lower poverty rates, some districts of the Sughd region also have high exposure to drought risk and relatively high exposure to flood risks, which can negatively affect large numbers of households given that the Sughd region is the second-most-populous in Tajikistan.

Figure 3. Map of Tajikistan with poverty and climate shock exposures

Populations with more than half of their land affected by drought risk and poverty



Population exposed to a water depth of at least 0.5 meters during a flood and poverty



Source: World Bank staff estimations using HBS 2021 data and the Agricultural Stress Index (ASI) of FAO.
Note: The poverty maps presented show the share of poor (not poverty rates) and their exposure to droughts and floods.

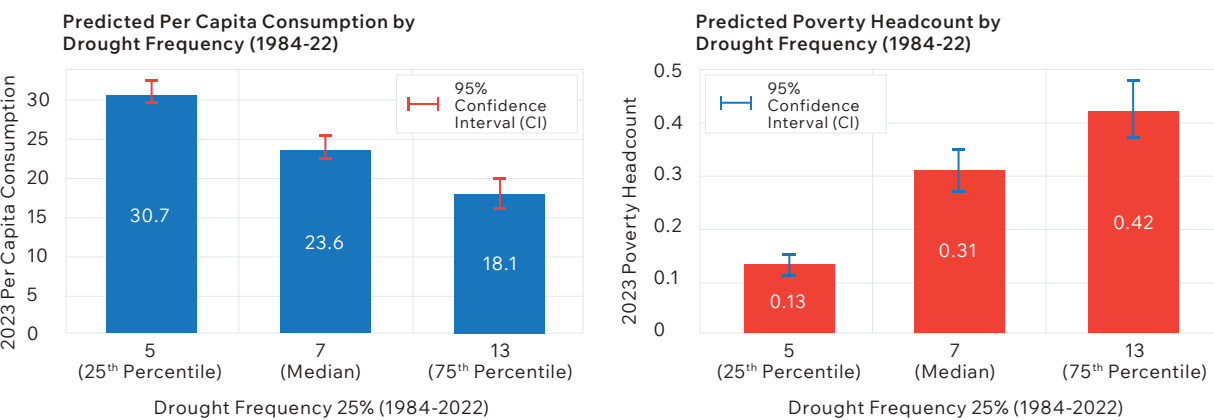
Impacts of climate shocks

Poverty is projected to be higher under both the optimistic and pessimistic climate change scenarios.

An increased frequency of droughts and floods is associated with reduced consumption per capita and, thus, increased poverty rates (Figure 4 and Figure 5). On average, an additional year of flooding is correlated with a consumption decline of 5.4 percent. This effect is higher than that of the repeated occurrence of drought, which may explain why flooding features more prominently within Tajikistan’s climate discourse. Comparing districts that have a median number of floods (6) in the past 40 years with districts that have 50 percent as many floods (9), consumption level is lower 27 percent and poverty level is higher by 14 percentage points.

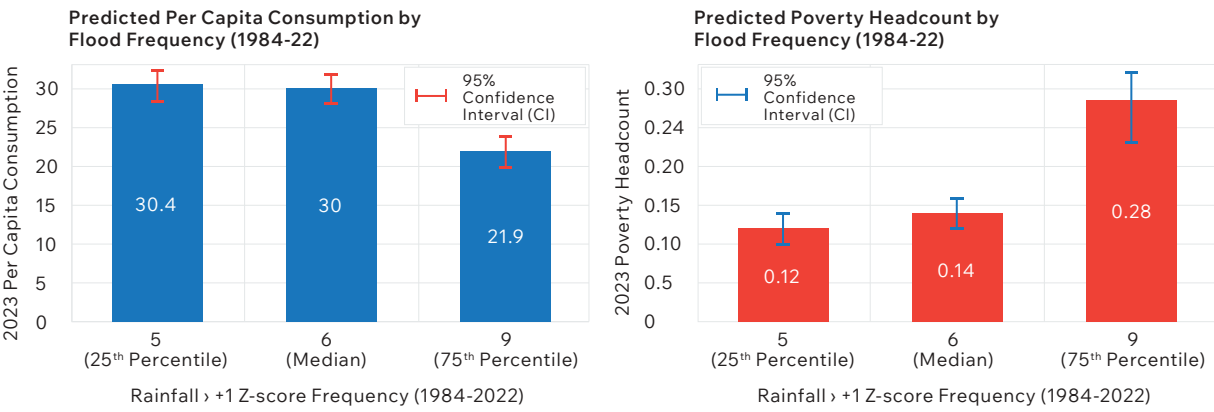
But a severe drought can have a significant impact. For example, analysis shows that the per capita consumption of households affected by droughts in 2022, conditional on experiencing drought in 2021, fell by 8.3 percent. Comparing districts that have a median number of droughts in the past 40 years with districts that have twice as many droughts, the consumption level is lower by 23 percent and the poverty level is higher by 10 percentage points. Furthermore, drought-affected households that live close to markets had higher consumption per capita than those unaffected by droughts but that also live close to markets. This suggests that access to markets helps increase the resilience of households by pushing them toward more lucrative off-farm work (such as trading in the market), while households that did not experience droughts in the previous year possibly remained in less-lucrative sectors such as farming.

Figure 4. The implications of exposure to droughts on consumption per capita and poverty



Source: World Bank staff calculations.
Note: Predictions based on OLS elasticities and Probit estimates. Drought Frequency is the number of years between 1984 and 2022 an Enumeration Area (EA) was exposed to severe drought [FAO Agriculture Stress Index (ASI) >= 25%]. A derivative of Vegetation Health Index (VHI), ASI measures the proportion of an area affected by drought (proportion of an area where VHI < 35).

Figure 5. The implications of exposure to floods on consumption per capita and poverty



Source: World Bank staff calculations.
Note: Predictions based on OLS elasticities and Probit estimates. Flood Frequency is the number of years between 1981 and 2022 an Enumeration Area (EA) was exposed to flooding (Excessive, above average rainfall). An area is assumed to have experienced flooding in any given year if the rainfall z-score exceeds 1.

Box 1. Welfare analysis of exposure to climate shocks

Welfare analysis of exposure to historical climate shocks

The first part of the study examines the short- and long-term association between experiencing climate shocks and welfare in Tajikistan. This includes:

- 1. Long-term effects:** We test the effect of repeated exposure to climate shocks on welfare by running an OLS regression of consumption or poverty on the frequency of the occurrence of droughts (or floods) during the 1984–2022 period among other controls such as access to infrastructure, urbanization, local prices of food items, livelihood zones, and employment sector of household heads.

2. **Short-term effects:** First, we examine the correlation between experiencing climate shocks in the 2022 season on households' welfare in 2023. Second, we exploit the exogenous variation in exposure to drought in 2022, as well as availability of pre- (HBS 2021) and post- (HBS 2023) data to investigate the causal effect of drought in a quasi-experimental fashion that allows for difference-in-differences (DID) identification (Lechner, 2010; Bertrand et al., 2003). The pre-data consist solely of households that experienced drought in 2021. Thus, the effects are interpreted as the causal impacts of experiencing two consecutive droughts on welfare.
3. **Heterogeneous effects:** The effects of climate shocks are complex. There are many factors that may exacerbate or mitigate the effects of climate shocks. The study also models how long-term exposure to droughts and floods interacts with access to infrastructure (i.e., distance to markets) and geography (i.e., altitude). This analysis has policy implications related to the potential mitigating impacts of public investments.

The remote sensing data for this analysis come from various sources. Drought is measured mainly from the Food and Agriculture Organization's (FAO) Agriculture Stress Index (ASI). To measure exposure to floods, we use the Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) rainfall data and assume excessive rain occurrence (which may result in flash or riverine floods) if precipitation is above 1 standard deviation of the long-term mean. Distance-to-road data are obtained from the Global Roads Open Access Data (GROAD), while distance-to-market and prices data are obtained from the World Food Program (WFP). We also use Livelihood Zones fixed effects coming from the FEWSNET's data.

Welfare analysis of exposure to future climate change and adaptation policies

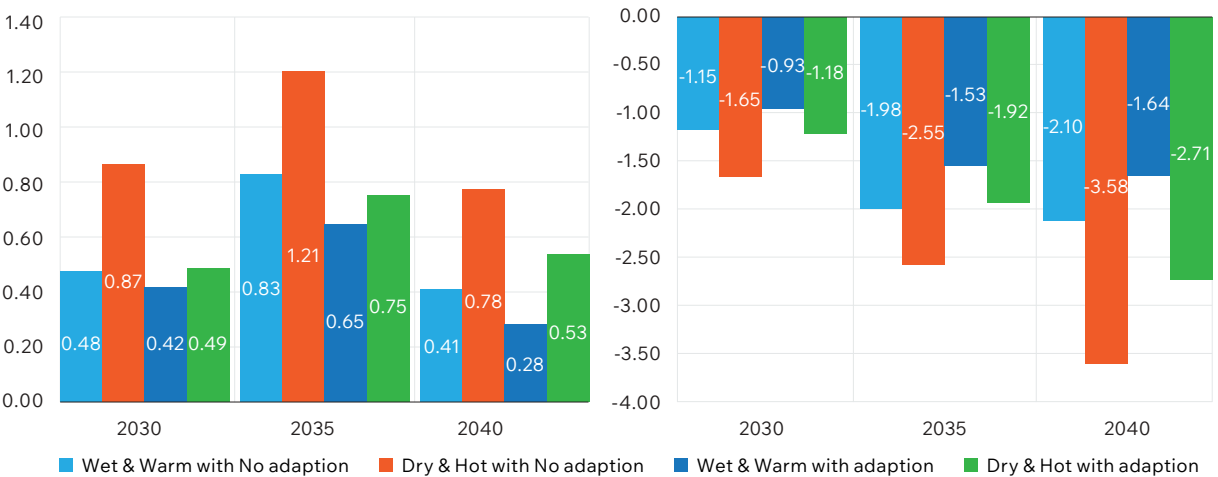
The welfare effects of different plausible future climate change scenarios are estimated with a top-down macro-micro model. At the top, we use the projections from the macro-fiscal model (MFMod), and at the bottom we apply a reweighting-based approach to the 2021 HBS for Tajikistan. The reweighting-based approach refers to a microsimulation that uses the changes in household weights to account for changes, not only in the main demographic components (such as the number and composition of sex and age, schooling and urbanization) but also in changes in the distribution of employment across economic activities or sectors.

The reweighting microsimulation analysis was conducted for the two principal future climate change scenarios considered in the Country Climate Development Report (CCDR) produced by the World Bank for Tajikistan. These scenarios are categorized as pessimistic and optimistic global mitigation scenarios. The pessimistic (dry/hot) scenario anticipates a temperature rise of 4°C by 2100, due to less ambitious climate policies and a diminished capacity of ecosystems to sequester carbon (ensemble average of SSP3–7.0 Global Climate Models [GCMs]). In contrast, the optimistic (wet/warm) scenario assumes global reductions in greenhouse gas (GHG) emissions that align with a temperature increase of only 1.5°C by 2100 (ensemble average of SSP1–1.9 GCMs). Both scenarios represent typical conditions for their respective climates. This chapter evaluates the poverty and distributional implications of these scenarios with and without adaptation strategies.

Looking into the future, microsimulation analysis shows that poverty reduction will be hampered by climate change. Droughts, which are recognized as a frequent and localized natural disaster in Tajikistan, hinder the structural transformation process, particularly during its agricultural phase. For a dry and hot future climate with no adaptation measures (pessimistic scenario), poverty is expected to increase by about 1.2 percentage points in 2035 compared with the reference scenario (Figure 6). This means some 150,000 additional individuals are expected be in poverty due to the adverse impacts of increased temperatures and dry conditions vis-à-vis the reference scenario. Meanwhile, a wet and warm climate with no adaptation measures, which includes increased frequency of floods, also increases poverty by 0.83 of a percentage point in 2035 compared with the reference scenario. The adverse impacts of both the pessimistic (dry/hot) and optimistic (wet/warm) climate scenarios on the poor considered start to decline by 2040.

The adverse impacts of climate change are not only limited to the bottom deciles of the population in terms of income or consumption levels. Even relatively well-off households are expected to face disruptions to their livelihoods because of climate change-induced shocks. The adverse impacts of climate change will extend to the middle class, which will increase by less than expected between 2030 and 2040 under all climate scenarios but especially for the dry and hot climate projections. For example, about 3.55 percent of the population (or about 474,000 additional individuals) is expected to fall short of achieving middle-class status due to experiencing a dry and hot climate with no adaptation in 2040 compared with the reference scenario (Figure 6). Furthermore, dry and hot climate with no adaptation is expected to increase the prosperity gap by about 5.9 percent by 2040.²

Figure 6. Impact of climate on poverty (national poverty line) (left) and middle-class (right)—deviations from the reference scenario (percentage point change)



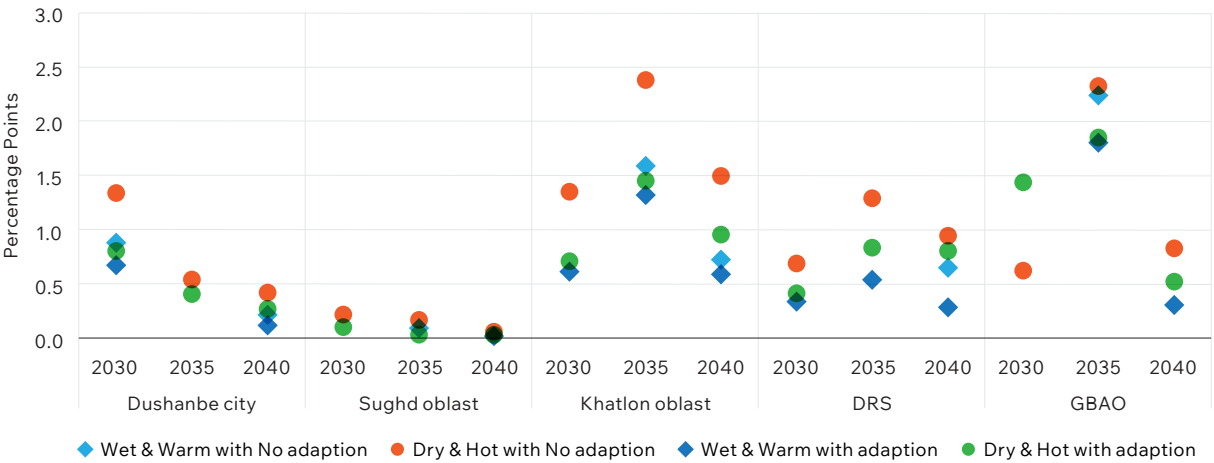
Source: World Bank staff calculations using a macro-micro simulation framework using HBS 2021 data and MFSmod projections.
Note: The comparison of poverty levels is with the contemporaneous reference scenario. Middle-income status in this report is defined as having an income of SM33.32 per adult equivalent per day or higher, which is roughly about two times the poverty line.

At the subnational level, the adverse impacts of climate change on poverty are relatively concentrated in three of Tajikistan’s five regions, namely the Khatlon region, the DRS, and the GBAO region (Figure 7). The Khatlon region largely relies on low-paid and climate-sensitive agriculture, the DRS districts are also largely located in hilly areas with exposures to both drought and floods (given proximity to Vakhsh and Kofarnihon rivers), while the GBAO

2 The prosperity gap, which is the World Bank’s new measure to monitor shared prosperity, is defined here as the average factor by which incomes need to be multiplied to bring everyone in Tajikistan to the prosperity standard of US\$25 income per day.

region’s mountainous terrain makes access difficult. Low-productivity agriculture is based on unsustainable land and water use practices. Soil erosion is widespread, pastures are overgrazed, and deforestation is rife. Already, more than 50 percent of the country’s land area is affected. The trend is the most notable in the mountain landscapes of the Khatlon region and in the areas surrounding Dushanbe, which are watersheds of the Vakhsh and Kofarnihon rivers (Amu Darya) that are critical for hydropower production. The annual average costs of land degradation in Tajikistan are estimated at nearly US\$325 million in 2023, equivalent to nearly 2.7 percent of the country’s GDP (World Bank, 2024). By 2035, under the dry and hot climate scenario with no adaptation, the poverty rate is projected to increase by 2.41 percentage points in the Khatlon region and 2.35 percentage points in the GBAO region compared with the reference scenario. Wet and warm climate scenarios, especially with adaptation, have the least negative impact on poverty in these three regions.

Figure 7. Impact of climate on poverty (national poverty line) — deviations from the reference scenario (percentage point change) by region



Source: World Bank staff calculations using a macro-micro simulation framework using HBS 2021 data and MMod projections.
Note: The comparison of poverty levels is with the contemporaneous reference scenario.

Conclusions

The welfare implications of climate change induced shocks are complex. For Tajikistan, household consumption and poverty are both adversely impacted by both short-term and long-term climate dynamics. The analysis on the short-term impact of droughts showed a decline in consumption of about 8 percent if a household experienced a drought in 2022, conditional on having also experienced it in 2021. In the long term, an additional year of drought during 1984–2022 is correlated with consumption decline of 4.5 percent. This effect, while substantial, is lower than that of the impact of an additional year of flooding, which is expected to reduce consumption by 5.4 percent. This suggests the urgency to address flood risks in the country while also highlighting the need to devote resources to mitigate the impacts of droughts. Analysis of the welfare implications of future climate scenarios suggests that a dry and hot climate scenario is projected to increase poverty and the prosperity gap, while shrinking the middle class. Wet and warm climate scenarios are also expected to have adverse impacts on these measures of welfare, though at lower levels than the pessimistic scenarios. Subnationally, the Khatlon region and GBAO are particularly vulnerable to climate change induced shocks, with Khatlon deserving a larger attention given its dependence on agriculture and the fact that the region is home for half of the poor of Tajikistan.

Chapter VII. Policy Implications



Photo: www.shutterstock.com | @Saiko3p.

Introduction

Poverty has decreased and the middle class has grown, not due to more economic participation, but because of higher sector returns and labor exports, given limited domestic opportunities. Inequality has increased, partially offsetting what could have been greater poverty reduction. Unequal access to opportunities, characterized by disparities in educational attainment that determine access to “closed” high-return sectors and remittances from abroad, has also contributed to the rise in inequality. The spatial distribution of poverty aligns with an unequal distribution of opportunities. The most agriculture-dependent regions account for a disproportionate number of poor individuals due to a lack of structural transformation and high exposure to climate shocks. Furthermore, human development has lagged monetary poverty reduction. The key challenges in accelerating poverty reduction and reducing inequality thus lie in: (i) improving access to domestic opportunities; (ii) investing in people to take advantage of those opportunities; (iii) protecting people and supporting them to adapt to shocks; and (iv) reducing spatial inequalities (or economic distance for lagging areas).

Expanding domestic opportunities, by kick-starting and leveraging agriculture transformation

There is need to kick off domestic structural transformation by strengthening agriculture. The share of agricultural employment (60 percent) and value added (25 percent) have remained steady over the past decade, indicating a stagnation in structural transformation due to limited growth in agricultural productivity. Without a strong agricultural foundation, industries cannot acquire competitive inputs, and services cannot find productive clients to serve. The challenges in agricultural transformation are linked to three main inefficiencies. First, the restrictions in crop selection imposed by state mandates on cotton and wheat. Second, the lack of access to information and skills for agricultural production. Third, susceptibility to climatic conditions and limited market access due to geographic remoteness. The corresponding suggestions are:

1. **Further relax state mandates in crop choices on all farms.** As of today, state mandates in cotton and wheat occupy about 30 percent of the irrigated land in Tajikistan (Figure 1), which is more than double that of other widely grown crops such as fodder and vegetables. Over 60 percent of these mandated crops are cultivated on household farmlands (Figure 2), reducing the potential for crop diversification and productivity improvements. Cotton cultivation in Tajikistan requires significant irrigation, utilizing approximately 45% of the country’s irrigated arable land. This heavy use of water resources places a strain on water availability and restricts the amount of land that can be allocated to other crops which might yield higher returns with less water consumption. Currently, Tajikistan’s wheat and cotton yields are below regional averages; for example, wheat yields in Tajikistan average 2.2 tons per hectare, compared to 4.5 tons per hectare in Uzbekistan. Despite Tajikistan’s climate being well-suited for the cultivation of high-value horticultural crops, from 2005 to 2022, the area dedicated to these crops in the Khatlon province increased by 2.7 times, yet they only represent 20% of the region’s agricultural land. This indicates a considerable opportunity to further develop lucrative export potential.

Figure 1. Share of irrigated land by crops (%)

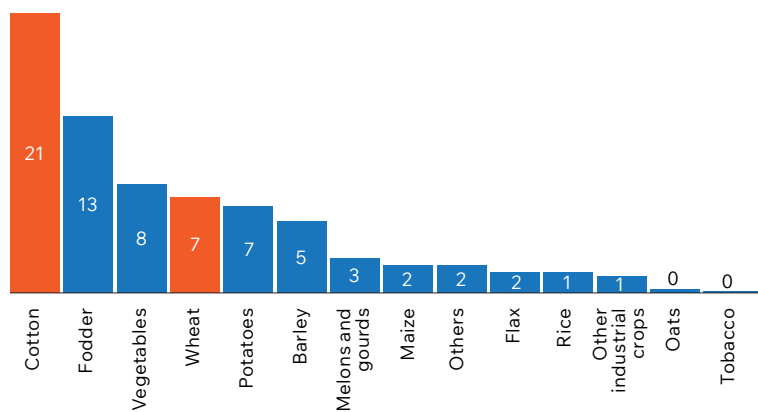
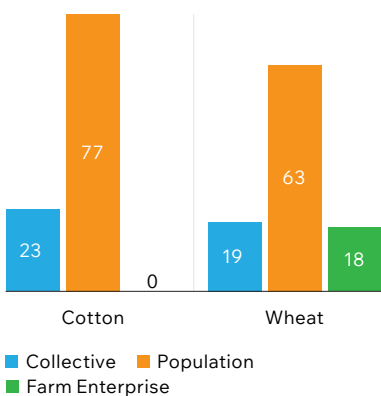


Figure 2. Land allocation by farm types (%)



Source: Tajstat.

2. **Enhance agricultural extension services in the Khatlon region.** Agricultural extension services are a recognized method to disseminate agricultural technology and provide access to information for farmers. Considering that Khatlon is the primary agricultural region in the country and host more than half of the country’s poor, enhancing agricultural productivity through extension services could significantly contribute to poverty reduction. However, public spending on agricultural extension services in Tajikistan is notably limited. The central government does not finance these services; instead, they are provided on a self-financing basis under Special Funds, leading to very low outreach. Consequently, only about 5 percent of the 180,000 farms and 14 percent of arable land benefit from professional extension services, indicating a dire need for expansion and improvement. Consultation with local NGOs indicated that farmers in the Khatlon region lack essential information regarding crop choices, market information, and production technologies.
3. **Invest in modernization of irrigation systems (e.g., drip irrigation) to increase water-use efficiency, and promote climate-smart technologies and practices in areas prone to natural disasters such as droughts.** Districts at a high risk of drought are often those also suffering from high poverty rates and their residents are more likely to depend on agriculture for their livelihoods. This underscores the importance of investing in modernization of irrigation networks to improve water-use efficiency, while also investing in the rehabilitation of degraded land (e.g., by rotation of over-grazed land), tree planting, and controlling erosion.

Creating jobs in private labor-intensive sectors

Transition from state-led, capital-intensive industrialization to grassroots-led, labor-intensive strategies, with an emphasis on agri-processing industries. State ownership in Tajikistan’s economy is substantial, with an estimated 70 percent in the industry sector. While industry’s GDP share has risen by 6.7 percent from 2013 to 2023 (Figure 4), its employment share increased by less than 1 percent, indicating a capital-intensive approach. The distribution of compensation between labor and capital also highlights this capital intensity. In the industry sector, less than 15 percent of the total value added is allocated to labor wages (Figure 3), while the remainder is attributed to capital and other factors. State presence in competitive industry sector and capital-intensive industrialization are two main reasons for insufficient domestic job creation. The corresponding suggestions are:

4. **Develop agri-processing industries that are more accessible to the rural and the poor.** Replacing existing capital with labor to adopt the labor-for-capital approach seen in the East Asia Miracles can be challenging. However, focusing on developing industries that are inherently labor-intensive will prove both feasible and effective. This will aid structural transformation in rural regions where poverty is most severe, especially in Khatlon and the DRS.
5. **Combat rent-seeking and market dominance to boost labor returns.** In the industry sector, more than 85 percent of value added is compensated to non-labor factors. Such large disparity indicates rooms for rent-seeking and the existence of market power. Campaigns against corruption and monopolies, especially in state-led industries, may result in wage increases.

Figure 3. Share of compensation to labor in total value added

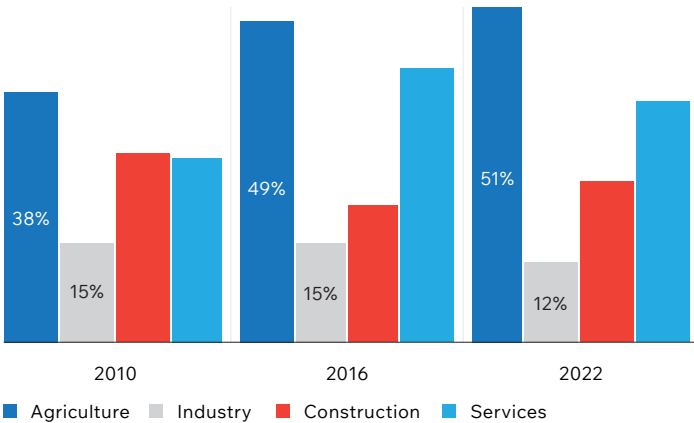


Figure 4. Percentage changes in value-added and employment, 2013–2023



Source: World Bank staff calculations and the Tajstat.

Unleash labor-intensive tradable sectors by liberalizing market entry. Labor-intensive tradable sectors such as retail, wholesale, catering, hotels, and transportation are accessible due to low skill requirements but offer higher wages than agriculture and non-tradable services because of their market linkages and economies of scale. However, these sectors have not grown in terms of share of GDP or employment in the past decade. For example, many last-mile delivery jobs in the postal courier services sector remain uncreated due to regulatory barriers for small and medium enterprises (SMEs). Mandatory licensing requires all postal operators to obtain licenses, even for non-sensitive deliveries, leading to overregulation that hinders competition and job creation. As a result, many courier services have become informal and remain underdeveloped. The corresponding suggestion is to:

6. **Reform regulations that prevent market entry in labor-intensive tradable sectors, prioritizing the postal and courier services sector.** Specifically, mandate licenses only for universal postal services and monetary transfers, excluding non-universal postal and courier services.

Equalizing access to opportunities: addressing spatial inequality of opportunities

Tajikistan’s mountainous geography limits infrastructure, market access, and service delivery, worsening regional inequalities. Poverty rates increase with altitude, and rural areas remain significantly poorer than urban centers, with 85% of the poor concentrated in Khatlon and the DRS. While urban economies are more diversified, rural areas are trapped in low-productivity agriculture, with limited job opportunities. Remittances have fueled inequality, benefiting those

who can migrate while leaving others behind. The lack of domestic job creation, especially in industry, prevents inclusive economic growth. Addressing spatial inequality through infrastructure investment, regional industrialization, and better education access is essential for reducing reliance on migration. Equalizing opportunities will create a more resilient and self-sustaining middle class, ensuring long-term prosperity.

Strengthen education and skills development in populous rural areas. Education gaps contribute most (8 Gini points) to rising inequality. At the same time, a substantial share of children, especially from the poor households, are not enrolled in school. Factors such as budget constraints, distance to schools, and parental perceptions determine enrolment status. The corresponding suggestions are:

7. **Build more schools at all levels in rural areas and invest in vocational training for adults.** Providing vouchers for children from low-income households can alleviate financial barriers to accessing education. Informational campaigns targeting households with lower educational levels can effectively address barriers to children's school attendance. In addition, providing vocational training for adults in language skills or other competencies relevant to labor migration can enable families to better access migration opportunities.

Equalizing access to opportunities by enhancing connectivity. The two primary factors that impede access to opportunities are insufficient information and limited mobility. For instance, Dushanbe and the Sughd region exhibit the lowest poverty rates in the country, yet there is minimal inter-regional population movement or rural-to-urban migration. The country's mountainous terrain complicates transportation access to the Sughd region. In addition, with less than 5 percent of households using the internet for productive purposes in 2023, labor market information remains inaccessible. This further exacerbates the segmentation of labor markets and restricts access to opportunities. The corresponding suggestion is:

8. **Invest in transport and digital infrastructure to integrate rural areas to national and global markets.** Besides digital infrastructure, creating a labor market information platform is crucial for matching employers with job seekers.

Strengthening protection of the vulnerable

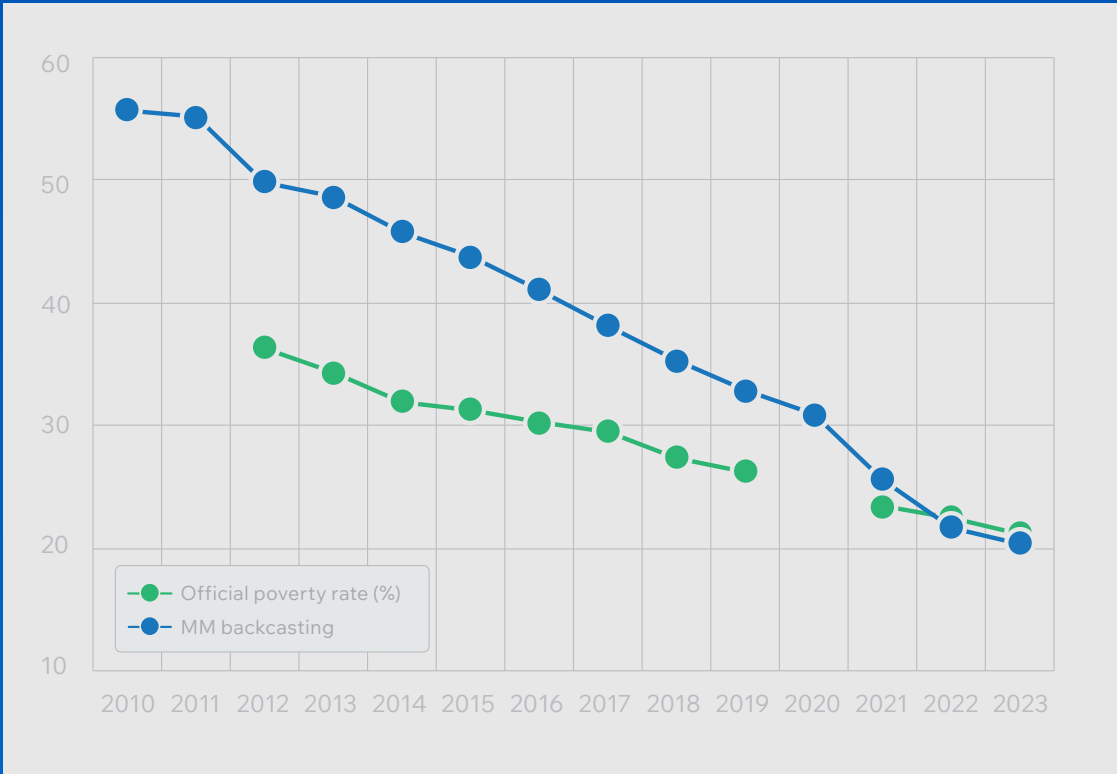
Tajikistan also faces challenges in protecting its most vulnerable populations from economic shocks. Although 45 percent of the poor receive public transfers, the majority of these are pensions, which constitute the lowest rate of all income sources. Non-pension public transfers reach less than 15 percent of the poor households, indicating under-coverage of the Targeted Social Assistance (TSA) program. Insufficient social protection mechanisms expose numerous households to the risk of reverting to poverty during crises, thereby also obstructing their progress towards achieving middle-class status.

9. **Expanding coverage of the Targeted Social Assistance program to support vulnerable populations and help them adapt to economic shocks.**

Macro-micro Simulation Model for "Backcasting" Poverty Trends in Tajikistan

A background paper for the Core Analytics of the Tajikistan Poverty and Equity Assessment

Chiyu Niu | Jin Yao | Na Zhang



1. Background

Data are the infrastructure of policymaking. The availability of accurate and timely data enables the development of impactful policies. National Statistics Committees play a crucial role in collecting and analyzing this data. In Tajikistan, in recent years Tajstat — the National Statistics Committee — has been committed to enhancing its capacity for data collection and processing.

Over the past decade, through a series of World Bank statistical projects, Tajikistan's Household Budget Surveys (HBS) have undergone significant modernization in questionnaire design, sampling methods, and data collection techniques. Since 2021, these improvements have made the HBS for 2021, 2022, and 2023 reliable sources of data for updating the national poverty line, calculating poverty rates, conducting poverty assessments, and informing poverty reduction strategies.

In September 2024, the Government of Tajikistan adopted a revised approach to measuring poverty, using the modernized HBS data starting from 2021. This updated approach and poverty line represent a significant step forward in the country's efforts to better understand and address poverty.

Analyzing poverty trends is essential for conducting poverty assessments and shaping effective poverty reduction strategies. However, the modernization of the HBS has made the data from before and after 2021 incomparable. This modernization limits the ability to establish a consistent poverty trend prior to 2021 using simple survey-to-survey comparisons. To address this gap, this paper employs a macro-micro simulation methodology to “backcast” poverty estimates for the period 2010–2020.

Specifically, we utilize data from the recent HBS surveys (2021–2023) to estimate how national economic growth, disaggregated by sector (agriculture, industry, services), translates into consumption growth across different parts of the consumption distribution (pass-through rates). These empirically derived pass-through rates, combined with historical sectoral GDP growth data from the National Accounts, are then used to adjust the HBS 2021 consumption distribution backwards in time, allowing for an estimation of consistent poverty trends over the past decade.

2. Methodology

To estimate poverty rates consistently from 2010 to 2020, this study employs a macro-micro simulation methodology for backcasting. The approach integrates data from recent rounds of the Tajikistan HBS 2021–2023 — specifically household consumption per adult equivalent and sectoral income shares — with annual real GDP growth rates by sector (agriculture, industry, services) covering 2010–2023, sourced from the World Bank’s World Development Indicators (WDI).

A central step of this simulation is the calculation of pass-through (PT) rates, quantifying the extent to which sectoral GDP growth translates into household consumption growth. These rates are derived by relating changes in household consumption (observed between the 2021–2023 HBS surveys) to a weighted average of sectoral GDP growth, where the weights are the household-level sectoral income shares from the HBS. Recognizing that the impact of economic growth varies across the population, we estimate PT rates heterogeneously across the consumption distribution rather than assuming a single, uniform rate. Specifically, households are grouped into consumption percentiles, so percentile-specific PT rates are calculated using average consumption growth and average sectoral income shares observed within each percentile group. This ensures that the simulation captures differential impacts of sectoral growth on households at various points in the consumption distribution. The subsequent sections (2.1–2.4) detail the specific steps involved in this backcasting procedure.

2.1 Household Consumption

The welfare measure used is household consumption per adult equivalent. This is calculated from the per capita total consumption, adjusted for household size and equivalence scale:

$$c_{ht} = pctot_{ht} \times \frac{N_{ht}}{N_{ht}^{ES}}$$

where c_{ht} is the consumption per adult equivalent for household h in year t , $pctot_{ht}$ is the per capita total consumption, N_{ht} is the household size, and N_{ht}^{ES} is the household size in adult equivalents.¹ Outliers with consumption z-scores greater than 3 or less than -3 were excluded from the analysis for calculating pass-through rates.

2.2 Sectoral Income Shares and Weighted GDP Growth

For each household h in the survey years ($t \in \{2021, 2022, 2023\}$), we calculate the household-level income shares from agriculture ($W_{h,Ag,t}$), industry ($W_{h,Ind,t}$), and services ($W_{h,Ser,t}$). Let H_{pt} denote the set of households belonging to percentile p in year t , and let N_{pt} be the number of households in percentile p in year t , we then compute the average sectoral income shares ($\bar{w}_{ps,t}$) across all households belonging to each consumption equivalence scale percentile:

$$\bar{w}_{ps,t} = \frac{1}{N_{pt}} \sum_{h \in H_{pt}} w_{hs,t} \quad \text{where } s \in \{Ag, Ind, Ser\}.$$

Let $G_{s,t,t+1}$ be the official GDP growth rate for sector s from the year t to the year $t+1$. The weighted GDP growth rate specific to each percentile p between year t and $t+1$ can be denoted by:

$$G'_{pt,t+1} = \sum_{s \in \{Ag, Ind, Ser\}} \bar{w}_{ps,t} \cdot G_{s,t,t+1}$$

¹ For details regarding adult equivalence, please refer to the official methodology note of poverty measurement.

This $G_{pt,t+1}$ represents the macroeconomic growth rate on average for households in percentile p , based on their income sources in year t .

2.3 Calculation of Pass-through Rates

The central step in the macro-micro simulation is calculating the pass-through (PT) rate, which measures how percentile-specific weighted GDP growth translates into consumption growth for that same percentile. The average consumption growth for each percentile p between year t and $t+1$ ($g_{pt,t+1}$) is calculated using the weighted mean consumption ($\bar{c}_{pt}$) for that percentile in each year. The weighted mean consumption is defined as:

$$\bar{c}_{pt} = \frac{\sum_{h \in H_{pt}} c_{ht} \cdot popw_{ht}}{\sum_{h \in H_{pt}} popw_{ht}}$$

where $popw_{ht}$ is the original population weight for household p in year t . Then, the growth rate is calculated as:

$$g_{pt,t+1} = \frac{\bar{c}_{p,t+1}}{\bar{c}_{pt}} - 1$$

The pass-through rate for percentile p between t and $t+1$ ($PT_{pt,t+1}$) is the ratio of the percentile's consumption growth to its weighted GDP growth:

$$PT_{pt,t+1} = \frac{g_{pt,t+1}}{G'_{pt,t+1}}$$

We calculate two pass-through rates: PT_p^{COVID} , the pass-through rate for 2021–2022, a period still influenced by COVID-19 pandemic effects, and PT_p^{Normal} , which represents the pass-through rate for 2022–2023, a year assumed to reflect a return to more typical economic conditions.

2.4 Back-casting Household Consumption (2010–2020)

Household consumption for the years 2010–2020 is estimated recursively backward starting from the HBS 2021 data. The process applies the relevant percentile-specific pass-through rates and percentile-specific weighted historical GDP growth to each household based on its percentile rank in 2021.

Let $c_{h,2021}$ be the observed consumption per adult equivalent for household h from the HBS 2021 survey and let $p(h,2021)$ be the percentile rank of this household in 2021.

- 1. Estimate 2020 Consumption:** Using the COVID-19 period pass-through rate $PT_{p(h,2021)}^{COVID}$ and the weighted GDP growth for that percentile between 2020 and 2021 $G'_{p(h,2021),2020,2021}$:

$$\hat{c}_{h,2020} = \frac{c_{h,2021}}{1 + PT_{p(h,2021)}^{COVID} \cdot G'_{p(h,2021),2020,2021}}$$

where $G'_{p(h,2021),2020,2021}$ is calculated using the average 2021 income shares for percentile $p(h,2021)$ ($w_{p(h,2021),s,2021}$) and the 2020–2021 sectoral GDP growth rates ($G_{s,2020,2021}$).

- 2. Estimate 2010–2019 Consumption:** Using the Normal-period pass-through rate ($PT_{p(h,2021)}^{Normal}$) recursively. For from 2019 down to 2010:

$$\hat{c}_{h,y} = \frac{\hat{c}_{h,y+1}}{1 + PT_{p(h,2021)}^{Normal} \cdot G'_{p(h,2021),y,y+1}}$$

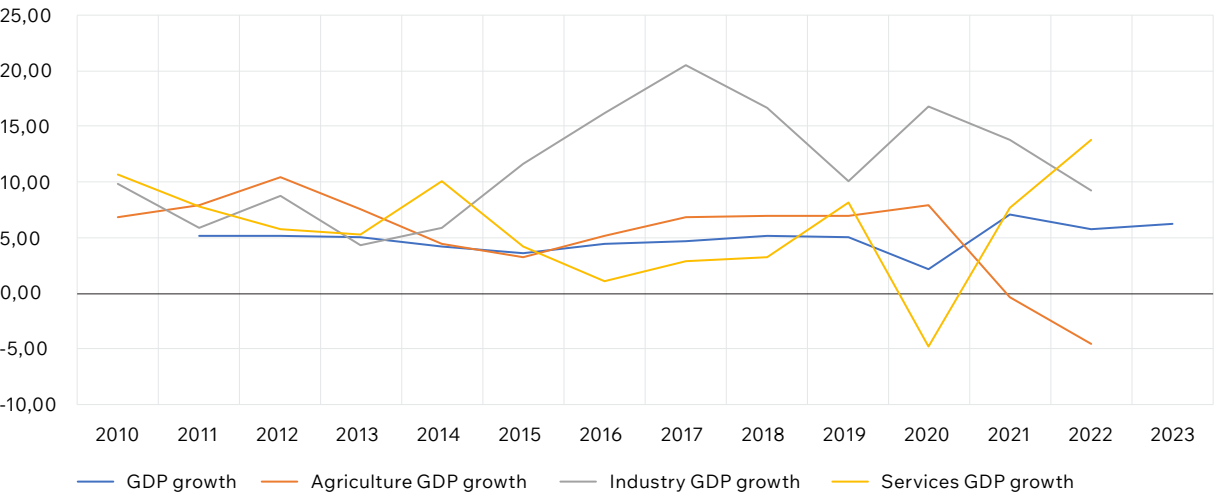
where $\hat{c}_{h,y+1}$ is the estimated consumption for the subsequent year (starting with $\hat{c}_{h,2020}$), and $G'_{p(h,2021),y,y+1}$ is the weighted GDP growth for percentile $p(h,2021)$ between year y and $y + 1$. This G' is

calculated using the average 2021 income shares for that percentile ($\bar{w}_{p(h,2021),s,2021}$) and the historical sectoral GDP growth rates ($\dot{W}_{p(h,2021),s,2021}$).

3. Summary of Statistics of the Inputs

While aggregate GDP growth in Tajikistan averaged a relatively stable 5 percent per year during the decade preceding the COVID-19 pandemic, this masked considerable heterogeneity across sectors. Sectoral growth dynamics often offset each other, most notably, the industry sector experienced accelerated growth after 2014, peaking around 2017 but remaining substantial thereafter. In contrast, agriculture exhibited a declining growth trend over this period, turning negative in 2021. Growth in services largely mirrored agriculture pre-pandemic but rebounded strongly post-2020.

Figure 1. Real GDP growth and by-sector growth



Source: WDI.

The average pass-through rates by sector reveal distinct patterns between the Normal (2022–23) and COVID-19 (2021–22) periods (Table 1). During the Normal period, the pass-through rate was highest in agriculture (0.407), followed by services (0.374) and industry (0.368). In contrast, pass-through rates were higher across all sectors during the COVID-19 period. In this period, the services sector shows the highest rate (1.582), followed by agriculture (1.482) and industry (1.469). The elevated pass-through rates during the COVID-19 year might suggest that household consumption was less sensitive to the concurrent sectoral GDP fluctuations, potentially due to consumption smoothing behaviors.

Table 1. Pass-through rates by sector

Pass-through Rates	Agriculture	Industry	Services
Normal 2022–23	0.407	0.368	0.374
COVID-19 2021–22	1.482	1.469	1.582

Source: World Bank staff calculations based on HBS 2021–2023.

On the national level, as households become wealthier (Table 2), their reliance on agricultural income decreases, while their dependence on services sector income tends to increase. Industry remains the largest average income source across most quintiles. However, these

national averages blend two distinct realities. In urban areas, agriculture contributes very little to household income at any level. Urban households rely heavily on the services sector (over 55 percent of income), with this share slightly lower for the richest households, while industry income generally plays a larger role for wealthier urban groups. In contrast, rural households show a more diversified income structure where agriculture remains important, especially for the poorest quintile. For rural households, industry provides a consistently large share of income across all consumption levels.

Table 2. Share of household income

National summary of average income shares by sector by quintiles 2021–2023

Quantile of consumption	Average agriculture share	Average industry share	Average services share
1	0.227	0.401	0.371
2	0.221	0.375	0.404
3	0.203	0.378	0.418
4	0.179	0.388	0.433
5	0.187	0.408	0.406

Source: World Bank staff calculations based on HBS 202–2023.

Rural summary of average income shares by sector by quintiles 2021–2023

Quantile of consumption	Average agriculture share	Average industry share	Average services share
1	0.278	0.406	0.316
2	0.272	0.389	0.340
3	0.264	0.387	0.349
4	0.245	0.389	0.366
5	0.264	0.412	0.324

Source: World Bank staff calculations based on HBS 2021–2023.

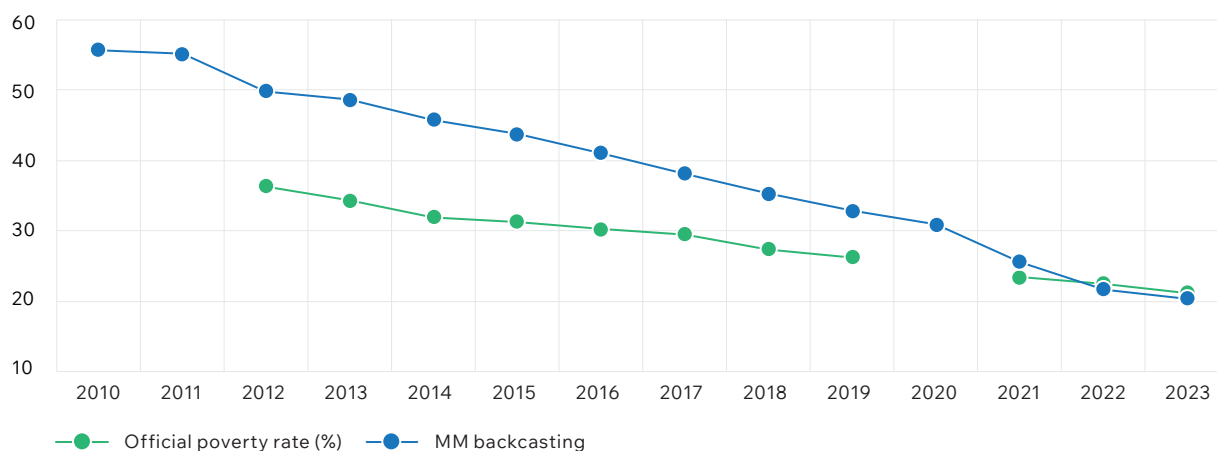
Urban summary of average income shares by sector by quintiles 2021–2023

Quantile of consumption	Average agriculture share	Average industry share	Average services share
1	0.039	0.381	0.580
2	0.046	0.328	0.626
3	0.049	0.356	0.595
4	0.040	0.385	0.574
5	0.039	0.401	0.561

Source: World Bank staff calculations based on HBS 2021–2023.

4. Results

Figure 2. Trends in poverty 2010–2023



Source: Tajstat and World Bank staff calculations based on HBS.

Figure 2 compares two poverty rate trends for Tajikistan. The official poverty estimates (green line), available for 2012–2019 and 2021–2023 (with 2020 data missing), depict a decline from 36.4 percent in 2012 to 26.3 percent in 2019, followed by a distinct level shift downwards after the series break, starting at 23.4 percent in 2021. Plotted alongside this is the consistently estimated 2010–2023 poverty trend derived from our macro-micro simulation (blue line). This backcasted series utilizes the pass-through methodology computed using the modernized HBS framework, providing a complete time series without the break observed in the official data.

The discontinuity in the official poverty trend between 2019 and 2021 highlights the series’ non-comparability over time. This break arises from significant methodological changes, including the HBS modernization from 2021, revised poverty calculation approaches,² and a substantial update to the poverty line itself (increasing from SM 8.82 used for 2012–2019 to SM 14.94 for 2021–2023, in constant January 2022 prices). Our backcasted estimates, aligned with the newer methodology, suggest considerably higher poverty levels prior to 2020 than officially reported under the old standard (e.g., 49.9 percent backcasted vs. 36.4 percent official in 2012). The simulation indicates a more significant reduction in poverty over the decade from 57.8 percent in 2010 to 27.9 percent in 2019. The backcasted estimate for 2020 (30.5 percent) fills the gap in the official series.

The official poverty trend suggests a relatively low pass-through rate from GDP growth to household consumption. From our macro-micro simulations (Figure 3), applying a distributional-neutral scenario with a PT rate of 0.27 generates a backcasted poverty trend that closely tracks the official figures. For example, the simulated poverty rate with PT=0.27 was 37.0 percent in 2012 and 28.3 percent in 2019, compared with official rates of 36.4 percent and 26.3 percent, respectively. This implied PT rate of 0.27 is notably lower than our estimates derived during the COVID-19 years using HBS 2021–2023 and the 0.85 rate commonly used for low- and middle-income countries (LMICs) (Lakner et al. 2020), and those used in Macro Poverty Outlooks.

² For example, prior to 2020, household welfare aggregates were calculated on a per capita basis, but after 2020, an adult equivalence scale was applied.

Figure 3. Simulated poverty trends with different pass-through rates

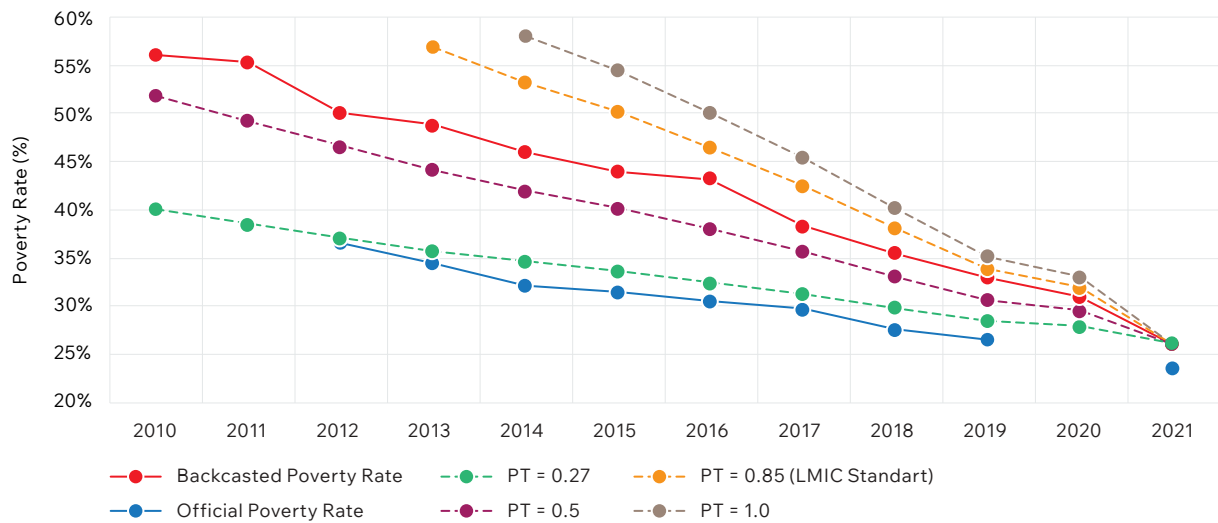
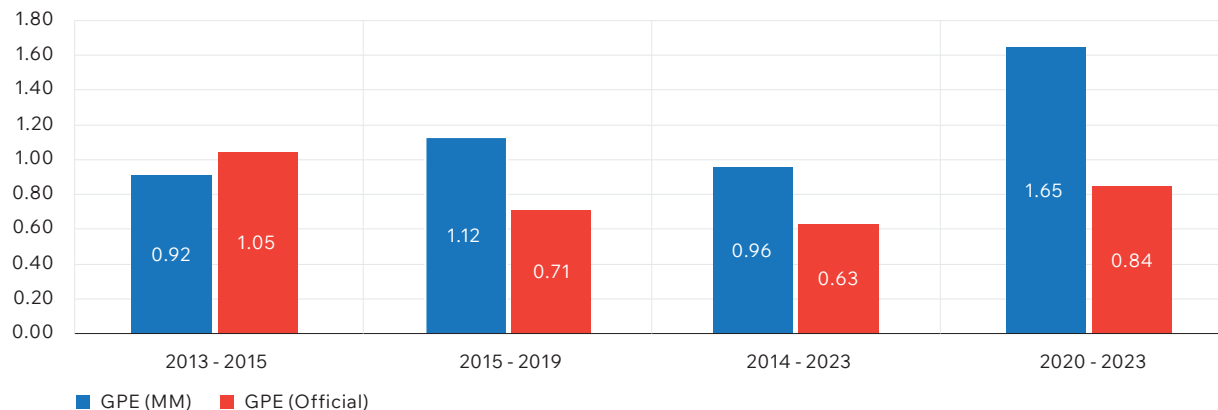


Figure 2 and Figure 3 reveal significant differences in the rate of poverty reduction implied by different methodologies and pass-through rates. The poverty trend calculated by the macro-micro model shows a more rapid poverty reduction than the official poverty estimates. Between 2012 and 2019, the backcasted poverty rate fell at an average of 2.4 percentage points per year, compared with 1.4 points per year for the official rate. This contrasts with the simulation using PT=0.27 (average decline of 1.2 points/year), and even more sharply with simulations using higher pass-through rates like PT=0.85 (average decline of 3.9 points/year). The consistently faster reduction shown in the backcasted poverty trend, especially its steady decline from 2016 to 2020, suggests that if the economic mechanisms functioned as captured by this specific model specification, the experienced GDP growth would have translated into substantially quicker poverty reduction than officially measured.

The estimated Growth Poverty Elasticity (GPE) differs significantly based on the underlying poverty measure, particularly after 2015. While the GPEs derived from macro-micro simulations and official data were comparable during 2013–2015 (0.92 vs 1.05), they diverge thereafter. The macro-micro method yields higher elasticities for 2015–2019 (1.12 vs 0.71) and especially over the longer 2014–2023 term, where the macro-micro-implied GPE (0.96) is substantially larger than the official GPE (0.63).

Figure 4. Growth Poverty Elasticity



Source: Tajstat and World Bank staff calculations using HBS 2021–2023.

The trajectory of China's GPE serves as an informative benchmark. Estimated at 0.41 in 1990–2000, China's GPE rose significantly to 1.02 in 2000–2010 and at 2.66 in 2010–2013. This substantial growth is often linked to specific policy shifts designed to make economic expansion more inclusive. Structural reforms targeting the agriculture sector, market access for smallholders, and infrastructure development in poorer areas are frequently cited as crucial factors that strengthened the linkage between macroeconomic performance and household welfare improvements. When compared, Tajikistan's recent GPE estimates based on the macro-micro simulation (about 0.9–1.1 in the 2013–2019 timeframe) align with the GPE level that China exhibited in the 2000s. Drawing from China's experience, proactive policy measures in Tajikistan can potentially complement growth strategies by improving distributional outcomes in elevating its GPE further.

The divergence between the backcasted poverty trends and the historical official series stems primarily from two methodological shifts. First, the national poverty line was substantially updated, resulting in a threshold 71 percent higher in real terms than previously employed for official estimates before 2020. Second, the HBS underwent extensive modernization encompassing questionnaire design, sampling strategies, and data collection protocols that were designed to capture household welfare more accurately.

While the macro-micro simulation approach provides a methodologically consistent historical poverty series based on current best practices, it works under the assumption that the pass-through rate is constant across the entire backcasted period. However, growth and household consumption likely varied over the past decade due to evolving structural factors, policy reforms, and market dynamics. For instance, pro-market reforms might plausibly have strengthened this linkage, while sector-specific downturns or adverse market conditions could have attenuated it. Consequently, the simulated poverty trend reflects historical dynamics under the hypothesis of stable pass-through.

5. Conclusion

This study demonstrates that backcasted poverty trends in Tajikistan using a consistent, modernized measurement methodology yields a more dynamic trend than the published official poverty trend. Our backcasted estimates, predicated on the updated national poverty line and the framework of the modernized HBS, reveal a more pronounced decline in poverty during periods of greater sensitivity to economic fluctuations. Furthermore, these estimates imply higher magnitudes for the GPE compared with those derived from the official trend.

While the assumption of a constant growth-consumption pass-through rate represents a limitation of the backcasting methodology, the analysis highlights the profound influence of measurement choices — specifically poverty line updates and survey design modernization — on perceived poverty levels and trends. The findings strongly suggest that, when assessed against current measurement standards, historical economic growth in Tajikistan may have been associated with a more substantial degree of poverty reduction than previously captured by official statistics using older methodologies. This revised historical perspective is critical for benchmarking progress, understanding the drivers of poverty reduction, and informing the design of future poverty relevant strategies.

The Journey of the Middle Class and Economic Mobility in Tajikistan

A background paper for Chapter IV

Deep Dive: Aspiring to Join the Middle Class in Tajikistan

Wondimagegn Tesfaye | Alisher Rajabov | Obert Pimhidzai



Photo: www.freepik.com | @Saiko3p.

Abstract

This paper explores the size, evolution, distribution, characteristics, and determinants of the “middle class” in Tajikistan. A middle-class threshold is defined based on vulnerability and economic security concept utilizing panel data from the Household Budget Survey (HBS). Tajikistan’s middle class has grown significantly, especially post-COVID-19 pandemic, from 24 percent in 2021 to 33 percent in 2023. This growth is strongest in urban areas, driven by labor income from non-agriculture sectors and private transfers. A notable share of households did not change economic class, reflecting path dependence. There is also a gradual progression of households across socio-economic classes and upward mobility, with the middle class having a negligible probability of falling into poverty. Labor mobility — into medium- and high-skilled occupations, out of agriculture and out of the country — is the key determinant of transition into middle-class status. After controlling for occupational resources and change in labor-market standing, we find that demographic factors, exposure to weather shocks, and location have a significant association with joining and staying in middle class, underscoring the importance of geographical and institutional factors. From policy perspectives, supporting labor market transitions and providing risk management measures can further enhance economic stability and support sustained middle-class growth.

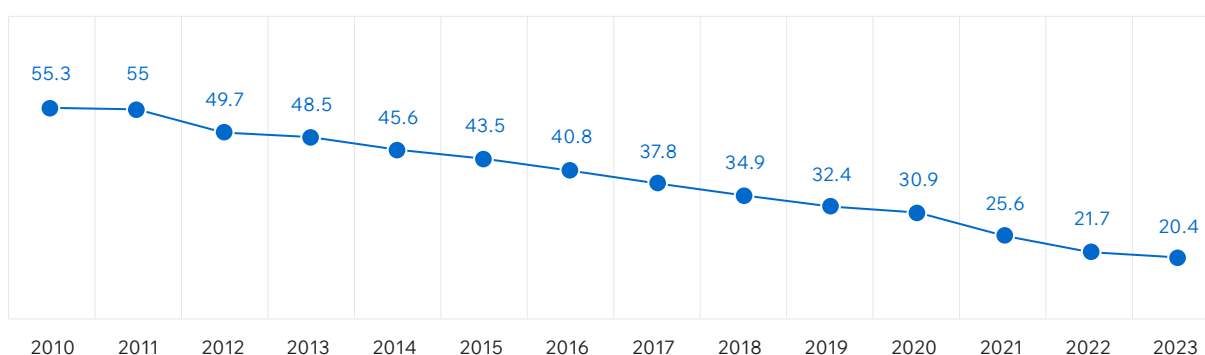
Keywords: *middle class, economic mobility, vulnerability, Tajikistan*

JEL Classification: I3, J6

1. Introduction

Over the past few decades, Tajikistan has made significant strides in reducing poverty. This achievement has been driven by high economic growth rates, substantial remittances, and basic economic reforms. Between 2000 and 2018, the poverty rate fell dramatically from 83 to 27 percent, with the economy growing at an average rate of 7 percent per year (Rajabov & Seitz, 2018). Results from backcasted analysis show that poverty reduction in Tajikistan was steady until the COVID-19 pandemic, with the national poverty rate declining from about 55 percent in 2010 to 31 percent in 2020 (Figure 1). Post-COVID-19 trends show a considerable reduction in poverty from 25.6 percent in 2021 to 20.4 percent in 2023 (Figure 1).

Figure 1. Trends in national poverty: 2010-2023



Source: World Bank staff calculations based on backcasted data (2010–2020) and the Household Budget Surveys in the years 2021, 2022, and 2023.

Note: Poverty estimates are based on national poverty line using consumption aggregates from official welfare surveys periodically collected by the National Statistical Committee of Tajikistan (Tajstat). Estimates in the period 2010–2020 are based on backcasted consumption aggregates.

Despite these achievements, Tajikistan remains vulnerable to economic volatility, external shocks, seasonal food insecurity, and climate change. A significant portion of the population still lives in poverty and faces limited economic opportunities. A large share of the population has consumption levels just above the national poverty line and remains at significant risk of falling below it. The economy of Tajikistan is also heavily dependent on external labor market demand, particularly from the Russian Federation (Rajabov & Seitz, 2018). This trend indicates a low degree of resilience and a risk of reductions in welfare in the event of covariate or idiosyncratic shocks.

Evidence-based policymaking requires an analysis of transitions in and out of poverty and economic security. While the focus of past development policy discussion puts more emphasis on the poorest, assessments of social welfare outcomes often comprise those above the poverty line (Ravallion, 2016). It is important to not only lift the poor above the minimum income threshold (poverty line) but also to protect the vulnerable (those close to the poverty line) from falling into poverty. Moreover, as countries grow and move toward middle-class income status, it becomes imperative to also analyse the transitions into the middle class over time. In relation to this, there is an emerging interest in the policy discourse on the non-poor segment of the population, particularly the middle class that is thought to be secure from falling into poverty (López-Calva & Ortiz-Juarez, 2014). The Government of Tajikistan has explicit interest in boosting the share of middle class in Tajikistan as noted in the National Development Strategy - 2030.

A growing and sustained middle class is a sign of healthy economic progress and a move away from poverty. A large and stable middle class is often praised to be the engine of economic growth, social cohesion, and better-functioning institutions (Loayza et al., 2012; Madland, 2015). It creates employment and productivity growth (Acemoglu & Zilibotti, 1997), provides vital inputs for the economy (Doepke & Zilibotti, 2005, 2008), and induces demand for quality goods (Birdsall, 2015). Economic security associated with being in the middle class leads to greater investments in physical and human capital, enhancing human capital formation and promoting inclusive growth (Banerjee & Duflo, 2008; Banerjee & Newman, 1993; Doepke & Zilibotti, 2005, 2008). A strong middle class advocates for policies promoting fairness, education, health, and social mobility (Loayza et al., 2012), thereby helping to reduce social tensions and inequalities, and increase social mobility (Wilkinson & Pickett, 2011). This relative social mobility prepares the middle class to serve as the engine of innovation and change (Corral et al., 2019). A thriving middle class can also contribute to stable political systems characterized by quality governance, democratic participation, and reduced corruption (Loayza et al., 2012). Overall, a robust middle class fosters a more inclusive economy, where the benefits of growth are more widely shared.

This background paper provides insights about the size, evolution, distribution, and characteristics of the middle class in the post-COVID-19 pandemic era utilizing recent household survey data and middle-class threshold. The definition of the middle class employed in this study is based on the concept of economic security. It is operationalized as the segment of the population that not only surpasses a certain poverty threshold but also remains sufficiently above it to have a low probability of falling back into poverty. In addition, an upper threshold is established to differentiate the middle class from the wealthier, more affluent group at the top of the income distribution. The primary data source for this analysis is the household budget survey (HBS) conducted between 2021 and 2023. To enhance the robustness of the findings, the paper also incorporates data from the Listening to Tajikistan (L2TJK) survey, allowing for triangulation of results from various approaches and data sources.

Tajikistan's middle class has grown significantly, especially post-COVID-19 pandemic era, from 24 percent in 2021 to 33 percent in 2023. This growth is strongest in urban areas, driven by labor income from non-agriculture sectors and private transfers. A notable share of households did not change economic class, reflecting path dependence. There is also a gradual progression of households across socio-economic classes and upward mobility, with the middle class having a negligible probability of falling into poverty. Labor mobility — into medium- and high-skilled occupations, out of agriculture and out of the country — is the key determinant of transition into middle-class status. After controlling for occupational resources and change in labor-market standing, we find that demographic factors, exposure to weather shocks, and location have a significant association with joining and staying in middle class, underscoring the importance of geographical and institutional factors.

The rest of the paper is organized as follows. Section 2 presents a conceptual framework and provides justification for the approach we take to define economic classes delineating the similarities and differences with other approaches adopted in the literature. Section 3 describes the data and empirical model utilized for the construction of middle-class lines and analysis. Section 4 discusses the main findings of the study. Section 5 concludes with suggestions to translate measurement to policy.

2. Conceptual framework

A middle-class threshold distinguishes between different economic and social classes using a combination of monetary and non-monetary indicators. As a poverty line helps discern the poor from the non-poor, the middle-class threshold helps to create heterogeneity within the non-poor segment of the population. Empirical studies have shown that asset ownership or livelihood capital is a significant indicator of long-term economic stability (Carter & Barrett, 2006; López-Calva & Ortiz-Juarez, 2014), making the asset framework a robust method for defining and analyzing the middle class in diverse economic contexts. The asset framework is particularly well-suited for empirically defining the middle class because it provides a comprehensive view of economic well-being beyond mere income levels (López-Calva & Ortiz-Juarez, 2014). It recognizes that income alone may not fully reflect a household's economic security, and that asset ownership plays a significant role in determining economic resilience. This approach is especially relevant in developing countries, where income volatility is high, and access to formal financial systems may be limited (Carter & Barrett, 2006).

2.1. Asset framework

The assets framework for defining the middle class involves assessing the ownership and accumulation of various assets that contribute to economic stability, security, and upward mobility. By considering the portfolio of assets — physical assets (e.g., property, durable goods, and digital assets), financial assets (e.g., savings and investments), human capital (e.g., education and skills), social capital (e.g., networks, norms, etc.), and natural capital (e.g., land, climate) — this approach captures the multifaceted nature of economic security and resilience. This framework focuses on the portfolios of productive, social, and locational assets that households possess, and how these assets interact with the policy, institutional, and risk contexts to influence livelihood strategies and well-being outcomes. This holistic perspective allows for a more comprehensive identification of middle-class households, reflecting their ability to withstand economic shocks and maintain a stable standard of living.

Physical assets, such as home ownership and durable goods, are critical indicators of economic stability. These assets can provide a buffer against economic downturns and contribute to a household's long-term financial security (Filmer & Pritchett, 2001). In the modern economy, digital assets such as access to the internet, digital literacy, and ownership of digital devices are increasingly important as they enable individuals to participate in the digital economy, access information, and engage in online education and remote work opportunities. Digital assets also facilitate entrepreneurship by providing platforms for e-commerce and digital marketing. As the world becomes more interconnected, the ability to leverage digital tools and resources is essential for maintaining middle-class status and achieving economic mobility (World Bank, 2016).

Financial assets, including savings and investments, are essential for managing risks and uncertainties, enabling households to maintain their standard of living during periods of income fluctuation (Moser, 1998). Human capital, reflected in education and skills, enhances earning potential and job stability, which are crucial for sustaining middle-class status (Becker, 1994).

Social capital — strong networks, relationships, and social norms that facilitate cooperation and support within a community — can provide access to job opportunities, business partnerships, and community resources. Social capital enhances economic resilience by offering support during financial hardships and enabling collective action for community development. The presence of robust social networks is a critical asset that can significantly influence an individual's or a household's ability to maintain and improve their economic status (Putnam, 2000).

Natural capital — resources such as climate, rainfall, land, and biodiversity — plays a crucial role in defining the middle class, particularly in agrarian and resource-dependent economies. Access to fertile land, reliable water sources, and favorable climatic conditions can significantly impact agricultural productivity and income stability through their effect on economic well-being and resilience to environmental shocks (Dasgupta, 2021). While favorable climate and adequate rainfall ensure consistent agricultural yields, which are essential for food security and income generation, adverse climatic conditions, such as droughts or floods, can lead to crop failures, loss of income, and increased vulnerability to poverty.

Individuals can achieve middle-class status through various pathways. Empirical evidence shows that a growing and stable middle class fosters economic growth and stability, improves social policies and governance, and enhances political stability and social modernization, while supporting market-oriented economic policies. A central question is what it takes for households to be in the middle class, i.e., how to climb from poverty and vulnerability to the middle class, and how to leverage a bulging middle class for improved social service delivery, productivity, equity, and inequality and poverty reduction. Pathways to the middle class typically involve a combination of factors that contribute to economic stability, upward mobility, and improved living standards. These pathways include education and skills development (Becker, 1994), employment opportunities (Fields, 2011), entrepreneurship (Banerjee & Duflo, 2011), asset accumulation (Carter & Barrett, 2006), and social policies (Torre, 2010; World Bank, 2018b). Each of these pathways plays a crucial role in enabling individuals and households to achieve and maintain middle-class status.

2.2. Approaches to define a middle class

There appears to be no agreement on how to define and measure the middle class. There are many acceptable ways to define the middle class that can vary by country (or regions) and over time, depending on economic, social, and cultural factors. Generally, the middle class is defined by a combination of income, education, employment, and ownership of assets that allows individuals to afford a comfortable standard of living, relative to the average in a given society. This can include the ability to afford housing, education, health care, and other essentials, as well as some discretionary spending. There is a large and burgeoning literature defining and measuring the “middle class” in a variety of ways. Broadly, there are two distinct literatures arising from the disciplines of sociology and economics. Below, we summarize the literature on the definition of the middle class that can be classified into three broader approaches: (i) sociological approach; (ii) economic approach; and (iii) vulnerability approach.

Sociological approaches to defining the middle class emphasize the role of occupational resources and self-reported perceptions. Traditionally, the middle class has been studied by sociologists who have tended to advocate for behavioural definitions based on characteristics such as education, occupation, assets ownership, or self-perception (Adelman & Morris, 1967;

Amoranto et al., 2010). The occupational-resources approach focuses on the types of jobs individuals hold and the stability these jobs provide, rather than purely economic measures (Torche & Lopez-Calva, 2013). This method accounts for middle-class mobility and stability by considering the occupational resources controlled by individuals. These early conceptualizations of the middle class started to acknowledge the importance of economic potential of households and individuals with the availability of income and consumption data that allow for the definition of middle class (Ferreira et al., 2013). In terms of self-reported perceptions, households identify their economic class status by categorizing themselves as poor, lower middle class, upper middle class, or rich (Pittau & Zelli, 2018). While in the past definitions have focused on the functional role of the middle class or occupational composition (e.g., coincidence with the white-collar group), more contemporary analysis of the middle class has taken advantage of available information on household welfare characteristics. The middle-class definition has, thus, progressively shifted to a quantitative measurement problem.

In the economics tradition, the definition of the middle class focuses on finding a threshold for inclusion based on a monetary measure of welfare (income or consumption) or the distribution of welfare. Economists have taken the lead in framing the issue in terms of income (consumption) or income (consumption) boundaries within which households or individuals can be categorized as middle class (Ferreira et al., 2013). There are two main approaches to this definition: absolute approaches and relative approaches. The absolute threshold method defines the middle class by setting fixed boundaries exogenously based on international benchmarks such as US\$10 to US\$50 per day per person in PPP terms or on the concept of economic security (Torche & Lopez-Calva, 2013). Commonly used thresholds include US\$2–US\$10 (Banerjee & Duflo, 2008) and US\$2–US\$13 (Ravallion, 2010). Relative measures on the other hand define the middle class as those around the midpoint of the welfare distribution, either using a range around the median welfare (e.g., including 75 to 125 percent of the median) or a fixed percentage of the welfare distribution (e.g., between the second and eighth deciles, between the 20th and 80th percentiles of welfare, etc.). Thresholds based solely on welfare measures or welfare distribution are increasingly seen as inadequate for accurately defining the middle class (Corral et al., 2019). This is primarily because the absolute thresholds are mainly suited for developed country contexts and the fact that the middle class often does not align with any function of the median welfare in developing countries. Atkinson and Brandolini (2011) emphasize the need to include wealth holdings and labor market position in these definitions to provide a more comprehensive understanding of economic classes. This is the core of the vulnerability approach to defining the middle class.

The vulnerability approach defines the middle class based on economic security and vulnerability indicators.¹ Economic vulnerability-based approach focuses on the likelihood of households falling into poverty due to economic shocks or other adverse events. Empirically, vulnerability is defined by the probability of a household falling into poverty. A common threshold is a less-than-10-percent probability of falling into poverty in the next period(s), distinguishing the middle class from the vulnerable below and the affluent above (Corral et al., 2019; López-Calva & Ortiz-Juarez, 2014). Economic security indicators, such as job stability, access to health and pension benefits, social safety nets, and the ability to save and invest, are used to assess economic security and middle-class status (López-Calva & Ortiz-Juarez, 2014). The vulnerability

¹ Economic security refers to the stability and predictability of income and employment, which reduces the risk of falling into poverty. It includes factors such as job stability, access to social safety nets, and the ability to withstand economic shocks. Vulnerability is the probability of a household falling into poverty due to economic shocks or other adverse events. It considers the household's ability to cope with risks and maintain a minimum standard of living.

approach posits that middle-class individuals can insure against idiosyncratic shocks, achieving a level of economic security that protects them from falling into poverty (López-Calva and Ortiz-Juarez, 2014; Dang and Lanjouw, 2017; Bolch et al., 2022). In this context, middle-class households are those that are “free from poverty” or economically secure and resilient. Thus, the middle class includes households that have moved beyond basic survival but are not yet affluent.

The vulnerability approach offers several advantages. It is particularly context-specific and can be tailored to the economic conditions of different countries, considering local factors that affect economic security and vulnerability. One key advantage is its focus on economic functioning. The approach defines the middle class in terms of economic stability, such as the ability to maintain a stable income and withstand economic shocks. The fact that the approach emphasizes stability and resilience makes it particularly relevant in developing countries where large segments of the population are at risk. From a policy perspective, the approach provides valuable insights for designing interventions that enhance economic security and reduce vulnerability. It helps identify households at risk of falling into poverty, enabling targeted support. Implementing this approach typically requires panel data. However, due to the scarcity of nationally representative panel data in many developing countries, alternative methods that utilize cross-sectional data have been developed. Several studies have constructed pseudo-panels from repeated cross-sections (Dang et al., 2014; Dang & Lanjouw, 2017, 2023) to estimate inter-temporal variations in consumption or income (Bolch et al., 2023; Fernandez et al., 2023). Other studies have used the Chaudhuri (2003) method, which utilizes cross-sectional variability across households to approximate households' intertemporal variability in consumption or income.

3. Methodology and Data

3.1. Data

The primary data for the middle-class analysis is the Household Budget Surveys (HBS). We utilized the panel data from three rounds of the HBS (2021–2023) to determine the proportion of the population that belongs to the middle class. The HBS, a nationally representative survey administered by Tajikistan's National Statistics Office, is used for official monitoring of poverty and the welfare of the population. It collects comprehensive information on various household and individual characteristics, including demographics, education, migration, dwelling, assets, and economic activity (labor market participation). This paper specifically analyzes data from the years 2021, 2022, and 2023. In addition, further analysis is conducted using backcasted consumption and poverty data from earlier periods (2013–2020).

We combined data from the Household Budget Surveys (HBS) with geospatial data. The HBS data does not include a shocks module that typically captures self-reported exposure to various shocks and coping strategies. To address this data gap, we leveraged the geo-referenced nature of the 2023 survey to extract weather shocks from various geospatial data layers. Specifically, historical rainfall data (1982–2023) were extracted from the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) to calculate long-term means and standard deviations, allowing us to capture rainfall variability. In addition, temperature data (1981–2023) were extracted from the Climate Research Unit (CRU) and used to compute long-term averages and standard deviations, enabling us to assess variations and heat stress based on annual rainfall deviations from the 98th percentile of the historical average. The constructed shock variables are used as additional regressors in the consumption regressions to establish the middle-class threshold and in the economic class mobility regressions.

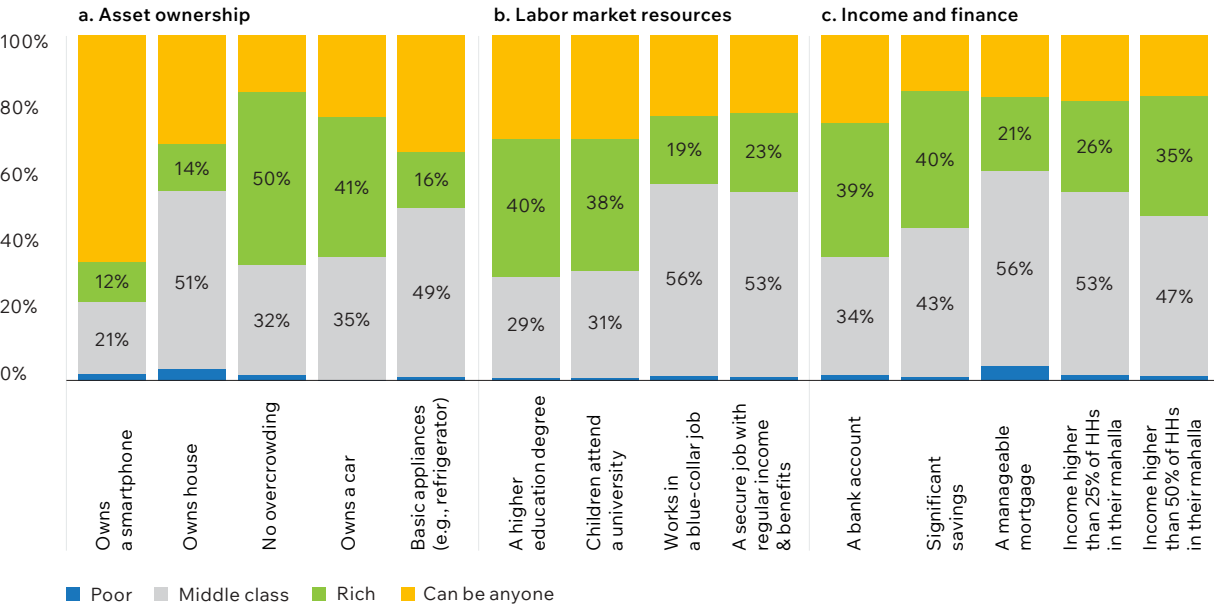
3.2. Tajikistan middle-class definition

Determining middle-class status in Tajikistan, as in many other countries, can be complex and needs a multifaceted approach that considers various indicators. The middle class is generally identified by a mix of income levels, educational attainment, occupational status, consumption habits, and social engagement. In Tajikistan, we employed a method focused on economic vulnerability and security for two main reasons. First, relative or purely absolute methods can be somewhat arbitrary, as there are no predefined criteria that specify which income deciles qualify as middle class. Second, given the lack of data on self-perceived status, the vulnerability approach is more appropriate for the local context, enabling us to empirically determine thresholds that indicate household economic security.

In the eyes of the Tajik people, attainment of the middle class is an economic concept associated with reduced vulnerability. The latest World Bank's Listening to Tajikistan (L2T) survey indicates that owning a house, car, and basic household appliances signifies middle class or wealth (Panel a of Figure 2). Higher education, blue-collar employment, and having a secure job with regular income and benefits are the labor market and human capital traits of the middle class or rich (Panel b of Figure 2). Having a bank account, significant savings, and manageable mortgage also mark middle-class status (Panel c of Figure 2). In addition, middle-class households typically have income exceeding 25 percent of households in the community.

While 70 percent believe that income alone is sufficient to define middle-class status, the remaining 30 percent appear to indicate the importance of non-income attributes. These attributes indicate economic security, as they signify stability and the ability to withstand shocks, which is crucial for defining middle-class status. As such, a middle-class threshold is defined based on vulnerability to poverty.

Figure 2. Attributes of a middle class in Tajikistan



Source: World Bank staff calculations based on Listening to Tajikistan (L2T) survey 2023–2024.

Notes: The survey asks which economic class (self-identified) possess the attributes analyzed.

Vulnerability to poverty is minimized when people attain consumption of at least 2.23 times the national poverty line. The vulnerability approach proposed by López-Calva and Ortiz-Juarez (2014) is adopted for defining the middle class in Tajikistan. Utilizing available panel data, which allows for the observation of poverty transitions and the calculation of vulnerability to poverty over time, the empirical framework proposed by López-Calva and Ortiz-Juarez (2014) allows defining the middle class as households with a low level of vulnerability to poverty. Statistical modelling from the HBS panel data shows that SM 33.32 per adult per day is the minimum consumption level associated with a 10-percent risk of falling into poverty over a three-year period, hence is used as the middle-class line in Tajikistan (see Annex B.1). Tracking the same households across time shows that 3.5 percent of households consuming at least this much in 2021 fell into poverty at least once between 2022 and 2023. Further analysis indicates that the vulnerability to poverty is lower at higher thresholds (see Annex B.1).

Middle-class thresholds are sensitive to the definition of falling into poverty. The HBS data have quarterly consumption aggregates (and poverty status in each quarter) for households that offer an opportunity to generate alternative middle-class thresholds. By exploiting this quarterly consumption data, poverty experience or falling into poverty can be defined based on annual or quarterly poverty transitions. As discussed above, the preferred definition adopted in this note is poverty experienced during 2021, 2022, and 2023. Middle-class thresholds are included using two alternative definitions (Table 1). Alternative 2 is based on poverty experience during 2021–2023 and falling into poverty or poverty experience is defined by comparing the same household across same quarters in different years (e.g., 2021 Q1 vs. 2022 Q1 or 2023 Q1). When

falling into poverty is defined as experiencing poverty anytime in 2022 or 2023 (47.5 percent of the households), the middle-class threshold will be SM 40.40 per adult per day (in 2021 prices), which is equivalent to 2.9 times the national poverty line (Table 1). Alternative 3, defining falling into poverty as experiencing poverty any time during the 12 quarters (58.8 percent of the households), the middle-class threshold will be SM 43.79 per adult per day (in 2021 prices). The sensitivity analysis results show that the probability of experiencing poverty (at least once) falls with the middle-class threshold (Figure 4).

The Chaudhuri (2003) method is applied for additional robustness check. The method allows for estimating household welfare variability and defining a middle-class threshold when only single or multiple rounds of cross-sectional data are available. It approximates households' intertemporal welfare variability using cross-sectional variability across households. The Chaudhuri method determines the vulnerability threshold—lower bound of the middle class—by identifying the monetary value of consumption associated with a 10-percent chance of becoming poor. First, the national poverty line is used to define poverty status in each survey year. Second, a vulnerability threshold is defined following several intermediate steps. The resulting vulnerability threshold corresponds to the lower boundary of the middle-class line derived from the panel data approach discussed earlier. Since this approach is applied to three rounds of data (2021, 2022, and 2023), an aggregate threshold is calculated by pooling the data with year fixed effects in the regression. See Annex B.2 for methodological details and Table B.3 for additional results. The value of this threshold (30.12) is slightly lower than the threshold obtained using the panel data approach (33.32) while both thresholds are roughly double the national poverty line. For methodological details and additional results, see Annex B.2.

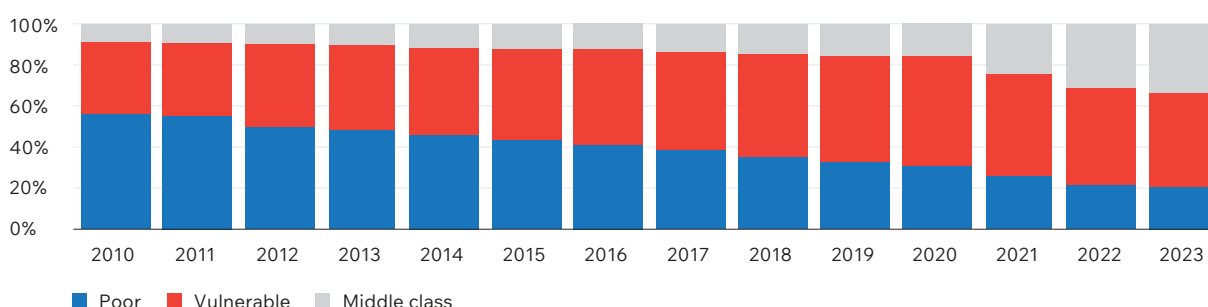
4. Results

This section is divided into three subsections. The first subsection discusses the results related to the threshold definition, and the size and spatial distribution of the middle class. The second subsection examines whether the economic classes exhibit significant differences in terms of demographics, human capital, labor market outcomes, asset ownership, access to basic services, consumption patterns, and natural capital endowment. The third subsection explores economic mobility patterns and their determinants.

4.1. Size, distributions, and trends of the middle class

Tajikistan experienced a gradual expansion in the middle class in the pre-COVID-19 period, which significantly accelerated in the post-COVID-19 era. The country has made notable progress in reducing poverty over the past decade and a half, with the national poverty rate decreasing from 55 percent in 2010 to 31 percent in 2020 (Figure 3). During the same period, the share of the vulnerable population increased, leading to a relatively small and stagnant middle class. The middle class grew from a low 8 percent in 2010 to 16 percent in 2020. While declining poverty rates during the 2010–2020 period were essentially accompanied by a rising share of the vulnerable population, this trend reversed during the 2021–2023 period, with both poverty and the share of the vulnerable population decreasing (Figure 3). As the country continues to register remarkable poverty reduction in the post-COVID-19 period the middle class expanded from 24 to 33 percent during the same period. These findings indicate a stronger poverty reduction and significant growth of the middle class in the recent period in Tajikistan.

Figure 3. Trend of the poor, vulnerable, and the middle class in Tajikistan, 2010–2035

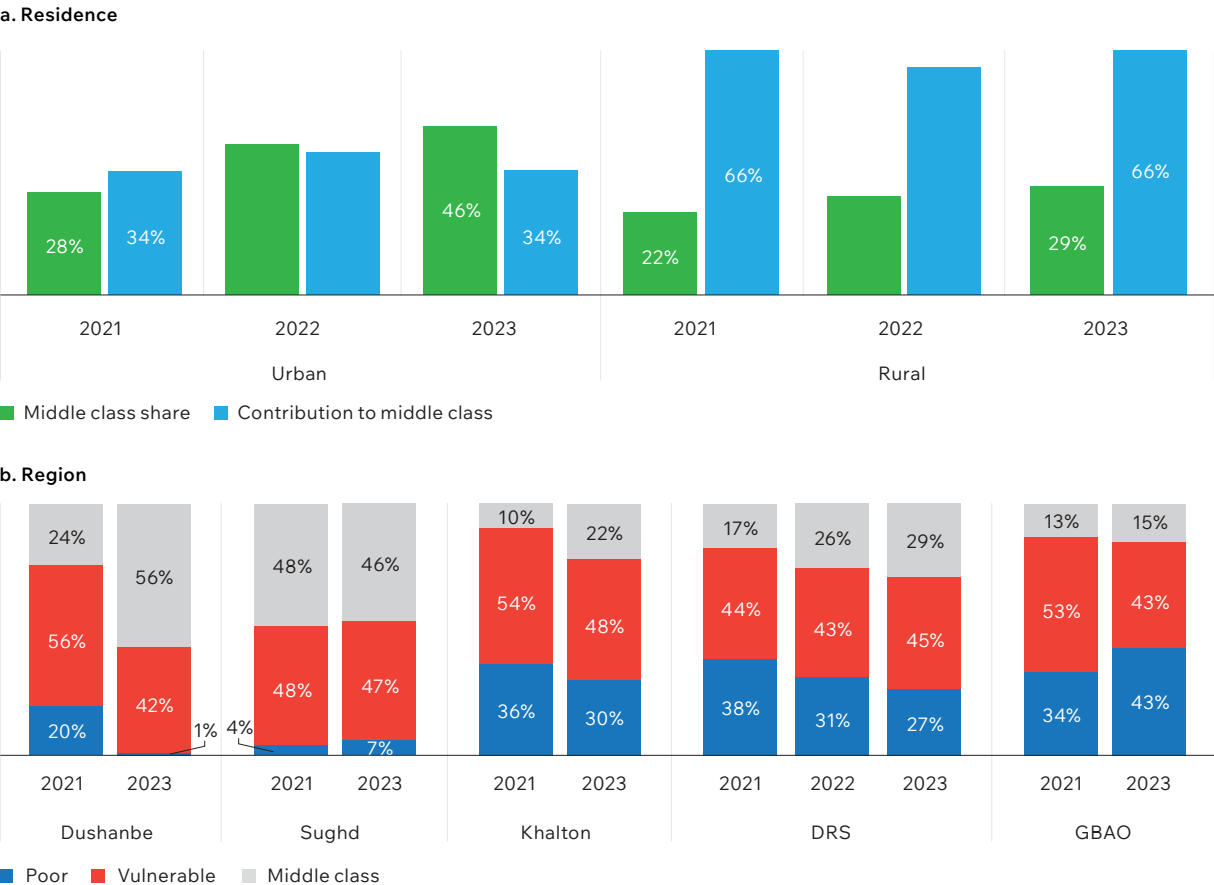


Source: World Bank staff calculations based on the HBS 2010–2023.

Notes: The results for 2010–2020 are based on backcasted data using the HBS.

The rise of the middle class is mainly an urban trend. In urban Tajikistan, the middle class grew from 28 percent in 2021 to 46 percent in 2023 (Figure 4). The middle class in rural areas also expanded, but by only 7 percentage points from 22 to 29 percent during the same period. However, due to their high population share, rural areas make up two-thirds of the middle class in 2023. There is notable regional heterogeneity in the size and expansion of the middle class. The Sughd region had the highest middle-class share in 2021 (48 percent) dropping to 46 percent in 2023, while in Dushanbe it increased from 24 to 56 percent. The Khatlon region and the DRS saw considerable growth from a low base in 2021, to a 12- percentage-point increase in 2023, whereas the share in the GBAO region only slightly increased during the same period.

Figure 4. Distribution of economic classes by residence and region, 2021–2023



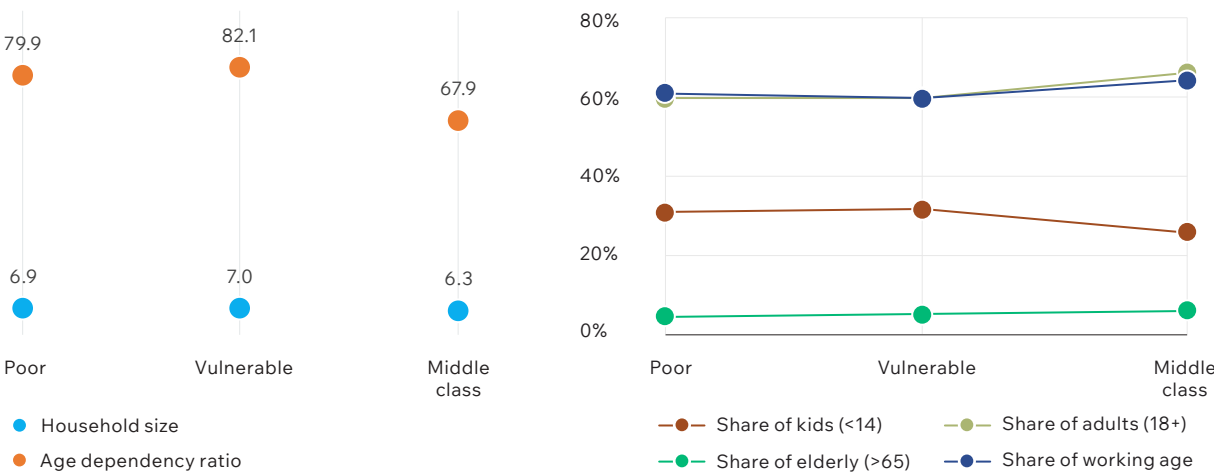
Source: World Bank staff calculations based on the HBS 2010–2023.

4.2. Profile of the middle class

This subsection discusses the characteristics of the different economic classes, focusing on the differences between middle-class and low-income households in terms of demographics, labor-market resources, income sources, and asset ownership. Understanding these characteristics is essential in identifying opportunities and constraints, and designing targeted policies that address the specific needs of different economic classes and promote sustainable development.

Middle-class households generally have fewer members, more working age members, and fewer dependents. Demographic patterns across economic classes, based on household size and composition, show that household size tends to decline with economic class, with poorer classes having relatively larger households (Figure 5). The proportion of children under 14 declines with economic class, while the share of adults and working-age individuals increases. Middle-class households have a lower age dependency ratio than poorer groups. This demographic structure can contribute to greater economic stability and resilience, as a higher proportion of working-age adults can support household income and reduce the financial burden of dependents. In addition, smaller household sizes in higher economic classes may reflect better access to family planning and education, which can further enhance economic mobility and overall well-being.

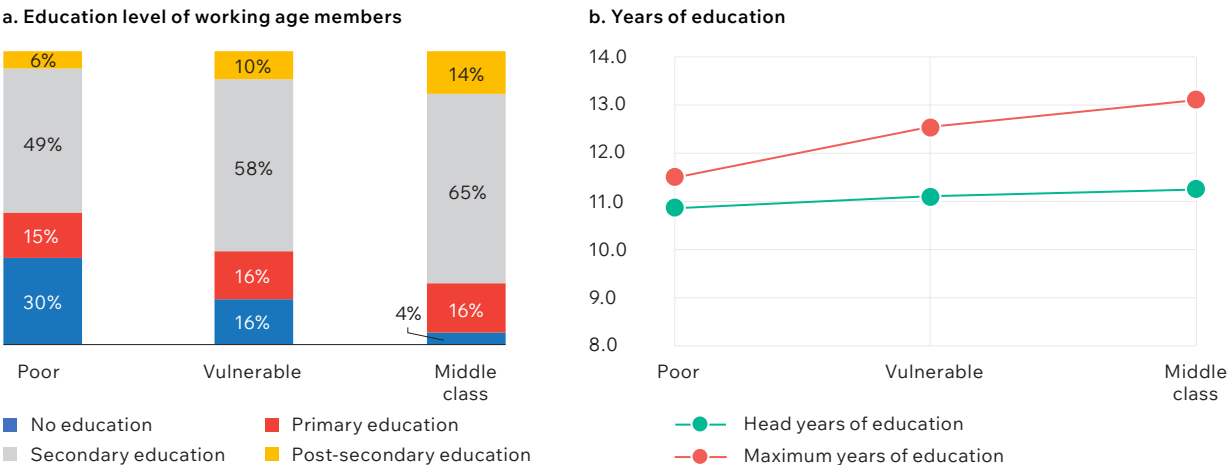
Figure 5. Demographic characteristics and economic class
(household size and composition by economic class)



Source: World Bank staff calculations based on HBS 2023.

Middle-class households have more educated heads and members. The share of working-age members with no education decreases with economic class: the share of members with no education falls from 30 percent among the poor to 4 percent in the middle class (Figure 6). This is accompanied by a sizable increase in the share of members with secondary education and above. Middle-class households tend to have a higher share of individuals with secondary or tertiary education (80 percent) compared with poor or vulnerable households. On average, the average years of education of the head and maximum years of education are higher for household is higher economic classes. These findings are significant because education is a key driver of economic mobility and stability. Higher levels of education among middle-class households contribute to better employment opportunities, higher incomes, and improved living standards.

Figure 6. Educational attainment in Tajikistan in 2021 and 2023



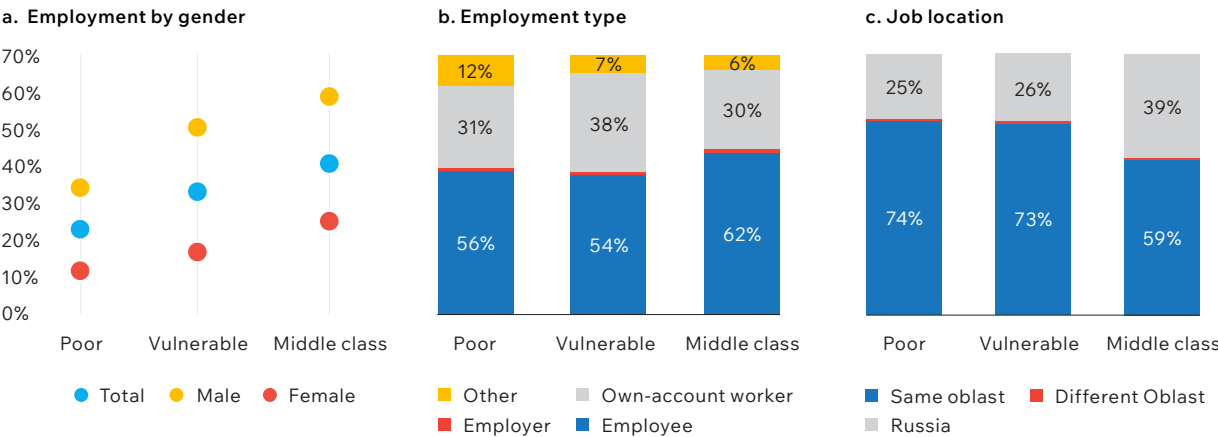
Source: World Bank staff calculations based on HBS 2023.

Notes: Results are based on HBS 2023 sample only.

Labor market participation is generally higher among middle-class households. The share of the working-age population employed is considerably lower among the poor (23 percent) but increases to 41 percent for the middle class (Panel A of Figure 7). This significant increase in employment rate suggests that, as households move up the economic ladder, they are more

likely to find employment opportunities that can then contribute to their economic stability and growth. This could also imply that the middle class could be a key contributor to the labor market, hence productivity and income to the economy. The flip side of the story is that a large share of the working-age population that is either unemployed or inactive is likely to fall into the lower economic classes. Looking at employment rates by gender, female employment rates are generally lower than male employment rates across the board. However, female employment rates are higher for the middle class than poorer households. The same trend applies for male employment.

Figure 7. Employment by gender, type, and location

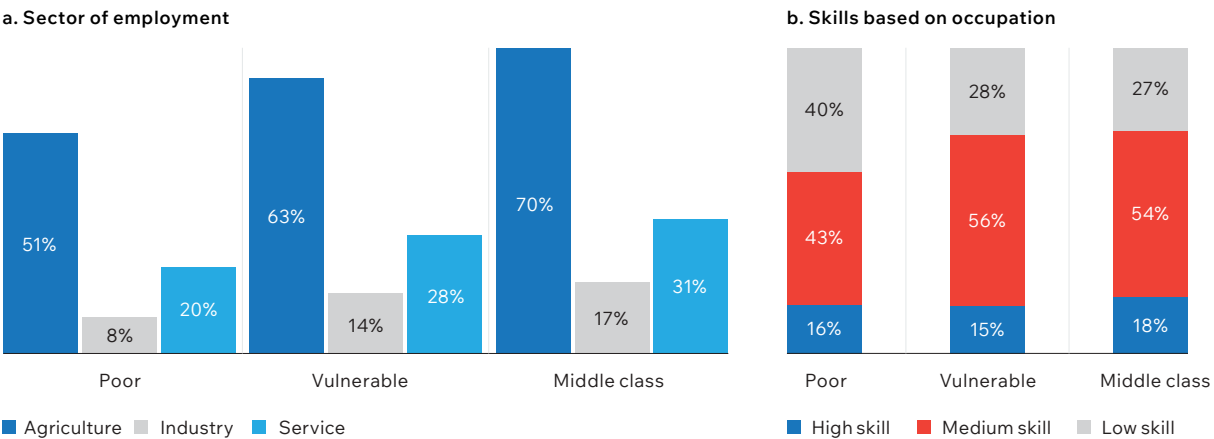


Middle-class individuals are more likely to be employed in the private sector. Wage employment dominates among both the middle class (62 percent) and the poor economic classes (56 percent). Self-employment in the form of own-account work is qualitatively similar for poor and middle-class households but higher among vulnerable groups (Panel B of Figure 7). The poor also engage in other employment forms, including apprenticeships and family work (with or without pay). Further disaggregation by type of employer, only 31 percent of the individuals from the poor class are employed in the private sector, whereas 54 percent of the middle-class individuals are employed in the private sector. The share of individuals employed in the public sector remains consistent at about 44 percent, regardless of economic class. Regarding location of employment, a large majority work within Tajikistan in same region of the household, while middle-class individuals more likely to work in the Russian Federation (Panel C of Figure 7).

There are employment sector and skill level disparities among economic classes. Typically, middle-class individuals are more likely to take on non-agricultural blue-collar jobs compared with those from the poor economic class (Panel A of Figure 8). Many middle-class households remain in agriculture, driven by the importance of the agriculture sector in the country's economy, and the sizable rural middle class. The data challenge the notion that only the poor or vulnerable predominantly work in agriculture. Looking at occupations, individuals from the poor economic class are more likely to hold low-skill jobs (elementary occupations), while around 73 percent of middle-class employment falls into medium- or high-skill jobs

(Panel B of Figure 8). High-skill jobs are predominately professionals and managers accounting for about 1 percent. Medium-skill jobs are dominated by craft and related trade workers (24 percent for poor vs 29 percent for middle class), and service and sales workers (11 percent for poor vs 17 percent for middle class).

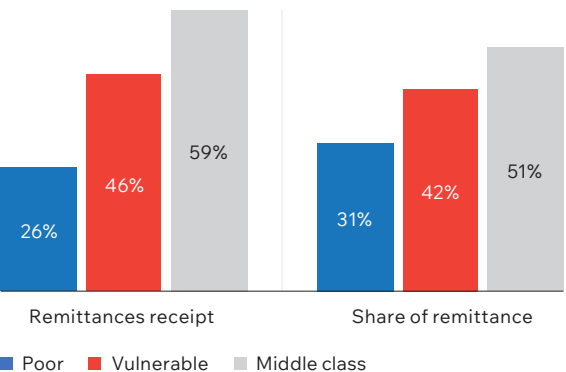
Figure 8. Sector of employment and job skills by economic class



Source: World Bank staff calculations based on HBS 2022.
Note: The skill category percentages may not total 100 percent because military personnel are excluded.

International remittances are crucial for the middle class in Tajikistan. There are diverse sources of non-wage income for Tajikistan households, ranging from pensions to international remittances. An important difference across economic classes, mainly between the poor and the middle class, is in the receipt of remittances, particularly those from international sources: 26 percent for the poor and 59 percent for the middle class received remittances in 2023 (Figure 9). This highlights the significant role of remittances in the economic well-being of higher economic classes. This also reflects the fact that Tajikistan is a remittance-dependent economy, with a substantial portion of its labor force employed abroad, particularly in the Russian Federation. The average monthly remittances per capita is SM 108 for the poor and about SM 294 for the middle class. Remittances make up 31 percent of the non-wage income for the poor and 51 percent for the middle class.

Figure 9. Remittance access by economic class (Share of population that receive remittances and share of remittances in non-wage income)



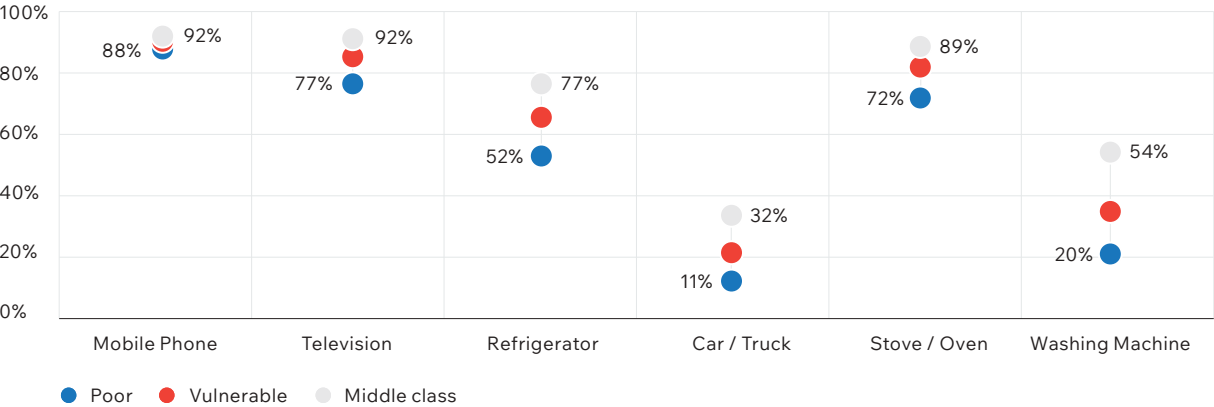
Source: World Bank staff calculations based in HBS 2023.
Notes: This is based on share of households that report receipt of remittances. The figures for (targeted) social assistance and child benefits are small to present.

percent for the middle class. This dependency on remittances not only underscores the importance of international labor migration for the country's economy but also highlights the vulnerability of the economy to external shocks, such as immigration policy changes or economic downturns in host countries.

Middle-class households are the primary owners of assets. The middle class appears to have a significant difference in durable asset ownership by economic classes. Analysis of key selected asset ownership by economic class reveals a distinct pattern. The data show that middle-class households tend to have a higher share of ownership of communication and technology assets, such

as mobile phones and televisions, with over 90 percent owning these items (Figure 10). They also tend to own their own transport assets and household durables such as cars, refrigerators, washing machines, and cooking ovens or stoves. The high ownership of durable assets suggests better financial stability and access to resources that can improve the quality of life. Ownership of communication and technology assets, in particular, can enhance access to information, education, and employment opportunities, further contributing to economic mobility and social inclusion. This asset ownership can also serve as a buffer against economic shocks, providing middle-class households with greater resilience. Poor households' lower ownership of durable assets highlights the need for targeted interventions to bridge the asset ownership gap.

Figure 10. Population with asset ownership by economic class



Source: World Bank staff calculations using HBS 2023.

4.3. Drivers of middle-class growth and economic mobility

The discussion in section 4.1. shows that large movements out of poverty have translated into increases in the middle class. This section focuses on economic class mobility — movement across economic classes over time — and drivers of middle-class growth. We first discuss the patterns of economic class mobility, followed by discussion of the drivers of middle-class growth and the determinants of economic mobility.

There is gradual progression of households across socio-economic classes exhibiting substantial path dependence. A class-mobility matrix of class position between 2021 and 2023 shows a high persistence of class and notable mobility across classes (Table 1). For instance, most households that escaped poverty (57 percent) moved into the vulnerable category (45.5 percent), while those in the vulnerable category either remained there (56 percent) or attained a middle-class status (30 percent). Some of the poor (11 percent) and a significant share of the vulnerable (30 percent) climbed into the middle class. About 72 percent of the middle class in 2021 stayed in the middle class in 2023, while 26 percent fell into the vulnerable group. There is some resilience to falling into poverty, with just 14 percent of households in the vulnerable category in 2021 finding themselves poor in 2023. Overall, the findings indicate that the middle class has a negligible probability of

Table 1. Economic class mobility in Tajikistan, 2021 – 2023

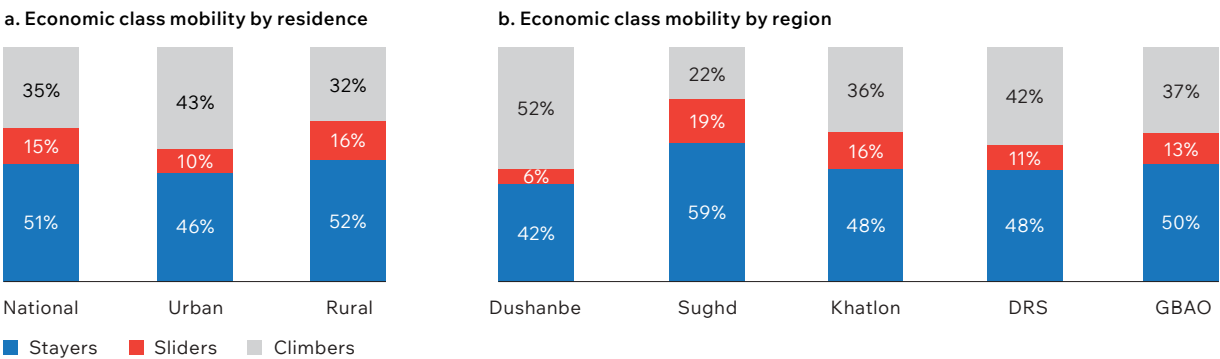
		2023		
		Poor	Vulnerable	Middle class
2021	Poor	43	45	11
	Vulnerable	14	56	30
	Middle class	2	26	72

Source: World Bank staff calculations based on the HBS 2021 and 2023.

falling into poverty (2 percent), sustaining the claim that middle-class upward mobility provides an almost certain insurance against economic deprivation.

There is significant economic class mobility in Tajikistan, with many households moving up the economic class ladder, while a considerable portion of the population sliding to lower classes. Categorizing the possible transitions into three groups based on class mobility between 2021 and 2023 — stayers, sliders, or climbers — 51 percent of the households stayed in their initial economic classes, 35 percent moved up, and 15 percent moved down into lower class (Panel A of Figure 11). This suggests significant upward mobility due to escaping poverty and joining the middle class, while downward mobility is mostly from middle class to vulnerable or from vulnerable class to poor. Spatial heterogeneities exist in economic class mobility: rural areas experienced higher downward mobility and less upward mobility compared with urban areas. The Sughd region shows higher downward mobility and less upward mobility, while Dushanbe has the highest upward mobility and lowest downward mobility (Panel B of Figure 11). Share of people moving across economic classes by residence and region, 2021–2023). The observed trends are consistent with the overall pattern of strong poverty reduction and smaller increase in inequality in urban areas and could be due to differing economic opportunities and dynamics of the labor market.

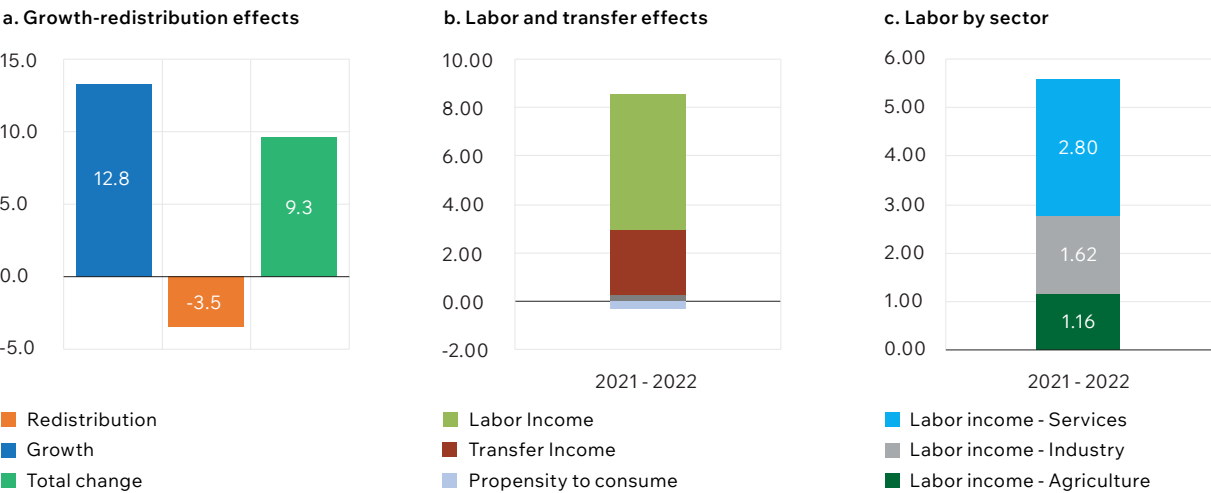
Figure 11. Share of people moving across economic classes by residence and region, 2021–2023



Source: World Bank staff calculations based on the HBS 2021 and 2023.
Notes: Reduced categorization of economic classes transitions: (i) stayers: if stayed poor, vulnerable, or middle class; (ii) sliders: if moved to lower class – from vulnerable to poor or from middle class to vulnerable or poor; or (iii) climbers: if moved from poor to vulnerable or middle class and from vulnerable to middle class.

Labor income and transfers have contributed to growth in the middle class. Datt-Ravallion decomposition results show that growth contributed 12.8 percentage points to growth in the middle class during the 2021–23 period, while redistribution had a negative effect, offsetting the middle-class expansion by 3.5 percentage points (Panel A of Figure 11). Results from Shapley decomposition show that labor income and transfers are primary drivers of middle-class growth (Panel B of Figure 11), respectively contributing 5.6 percentage points (or 68 percent) and 2.7 percentage points (or 33 percent) to the expansion of the middle class. Their contribution to middle-class growth was partially offset by a small increase in the savings rate. Within transfer income, private transfers contribute the most (25 percent) to middle-class growth. The results indicate that transfers had a greater impact on middle-class growth compared with poverty reduction (as a share of the total), while the contribution of labor income was slightly less.

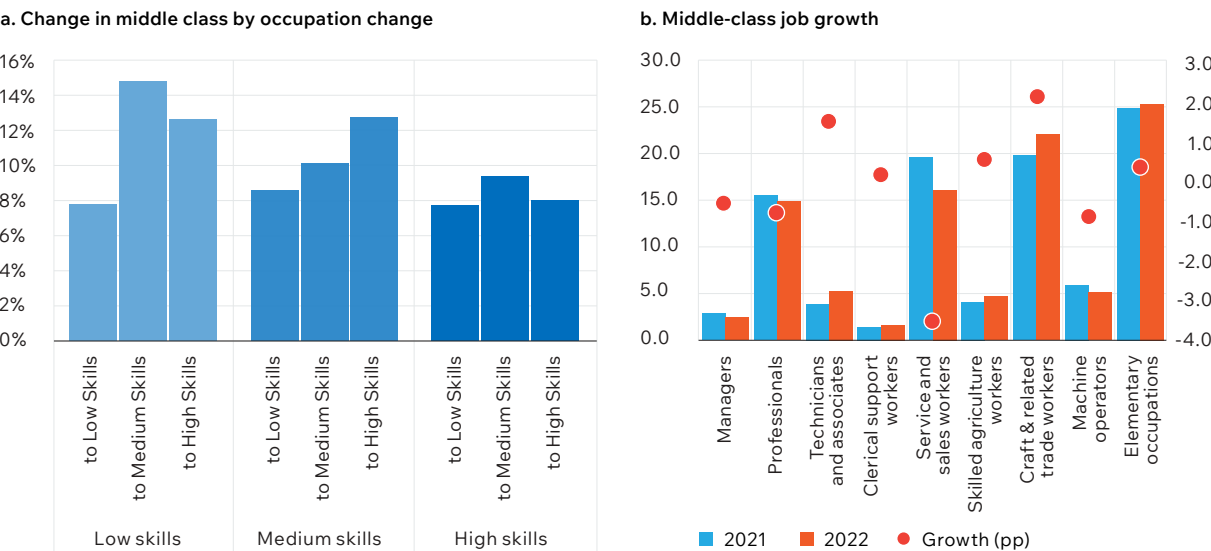
Figure 12. Drivers of middle-class expansion: Shapley decomposition



Source: World Bank staff calculations based on the HBS 2021 – 2023.
Notes: Panel a displays results from the Datt-Ravallion decomposition (2021 – 2023), while Panels b and c present results from Shapley decomposition by income components and labor by sector (2021 – 2022), respectively.

Labor income from the services sector is the most significant contributor, followed by labor income from the industry sector. Further disaggregation of the contribution to middle-class growth of labor income shows that labor income from services contributes the most to middle-class growth, at 2.8 percentage points (34 percent), comprising half of labor income’s contribution (Panel C of Figure 12). Labor income from industry contributes 1.6 percentage points (20 percent) to middle-class growth, or 29 percent of labor income’s contribution. While employment in the agriculture sector was an important factor for poverty reduction, employment in the non-agriculture sectors appears to be more effective in promoting middle-class growth in Tajikistan.

Figure 13. Growth in middle class by occupation transitions and middle-class jobs growth

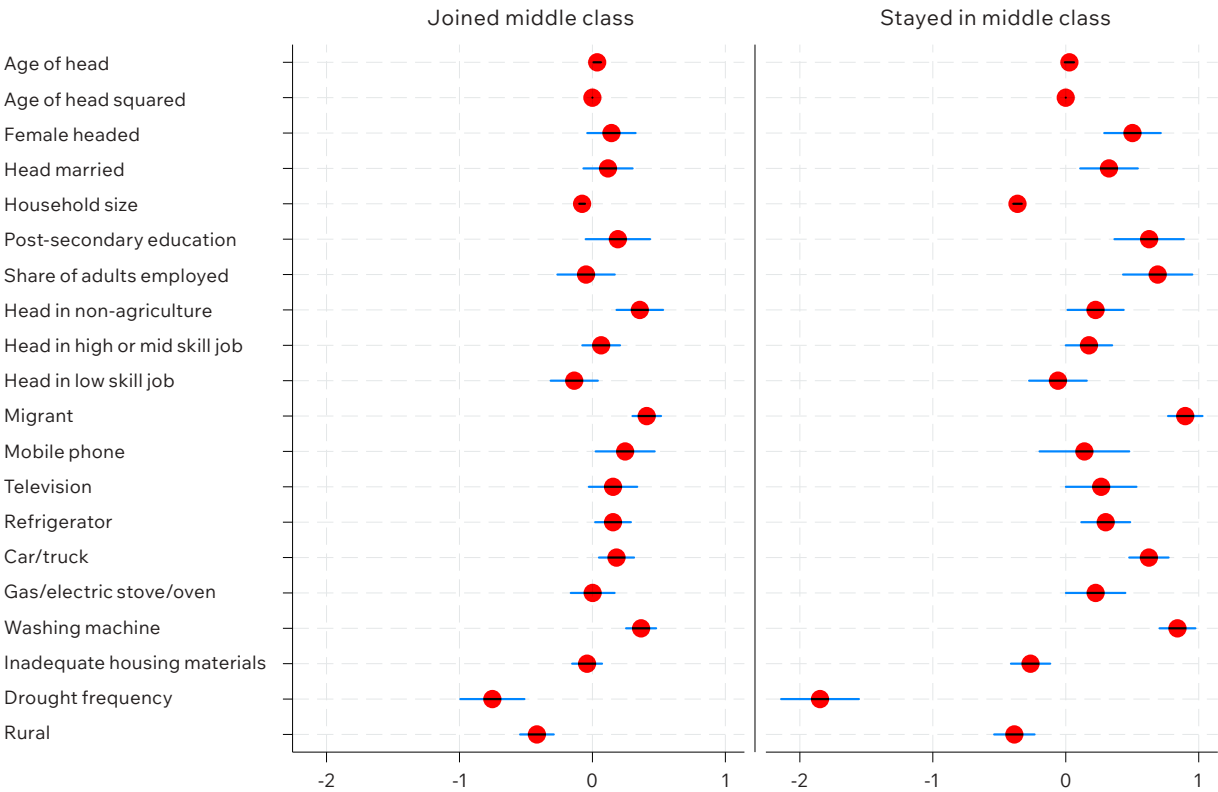


Source: World Bank staff calculations based on the HBS 2021 and 2022.
Notes: Panel A shows the percentage change in the middle class (2021 to 2022) by occupation transition of the head. Panel B shows the head’s occupation and job growth within it for middle-class households. High-skilled jobs: managers, professionals, and technicians and associate professionals; low-skilled jobs: elementary occupations. Military personnel are not classified by skill. Other occupations are medium skill.

Labor mobility into medium- and high-skilled occupations, away from agriculture, and out of the country is the key determinant of transition into middle-class status. Results from a multinomial logit model of joining a middle class and middle-class stability (Figure 13) show that households with heads employed in industry or services, particularly in high- or medium-skilled jobs, are more likely to achieve and maintain middle-class status. More importantly, occupation transitions from low- to medium- or high-skilled jobs have significant contribution to middle-class growth (Panel A of Figure 13). Households that made a progressive transition into medium- or high-skill jobs saw an increase of more than 13 percentage points in the middle-class share. In contrast, households that stayed in or made a regressive transition to low-skill occupations experienced a less-than-10-percentage-point increase.

However, growth of high-skilled jobs associated with the middle class remains limited. Employment in managerial roles is low overall and stagnant from 2021 to 2022 (Panel B of Figure 13). High-skill jobs are largely dominated by occupations such as professionals, but their growth during this period is very low. An exception is the technician and associated professionals’ occupation, which saw a growth of 1.6 percentage points despite their overall low prevalence. The most notable growth in middle-class jobs is in medium-skilled crafts (and related) and skilled agricultural work.

Figure 14. Determinants of economic class mobility



Source: World Bank staff calculations based on the HBS 2021, 2022, 2023.
Notes: Figure plots the average marginal effects estimates obtained using a multinomial logit model of economic class mobility. The analysis is based on reduced categorization of economic classes transitions and a balanced sample. The reference category is staying poor or vulnerable in both periods (2021 and 2023). Results remain consistent with additional control variables, such as occupational change, change in number of adults employed, and change in household size.

Education matters for ensuring middle-class stability, while its correlation with joining the middle class is less pronounced. Post-secondary education is positively correlated with middle-class stability but not with joining the middle class (Figure 14). This effect may reflect a household’s social capital and access to resources that could reduce vulnerability. Furthermore,

higher education achievement could affect economy mobility by equipping individuals with skills necessary for upward occupational transitions. Households with members who have attained higher education levels are more likely to secure medium- and high-skilled jobs, which are pivotal for sustaining middle-class status. The importance of education is further underscored by its role in mitigating the adverse effects of economic shocks.

Migration is associated with better prospects of both joining and remaining in the middle class. This underscores the importance of remittances for economic advancement and upward mobility. Remittances sent by migrants provide crucial financial support for families in the place of origin, enabling investment, which is key factor for upward socio-economic mobility. Furthermore, the growing middle class in Tajikistan is driven by private transfers, which exemplifies the significant impact of international labor migration and external financial flows.

Demographic factors influence joining and staying in the middle class. After controlling for occupational resources and change in labor-market standing, the probability of joining the middle class increases then decreases with age (Figure 14). Female-led households (mainly widowed, at 77 percent) are more likely to maintain their middle-class status. This finding somehow challenges the conventional wisdom that associates higher levels of poverty and vulnerability with female-led families due to potential reliance on a single income source and the difficulty of balancing household and labor market responsibilities (Torche & Lopez-Calva, 2013). Households with married heads are more likely to stay in the middle class, potentially due to higher human capital and occupational resources associated with married couples. Household size is negatively correlated with both joining and staying in the middle class, primarily due to larger share of dependents.

Conclusion

Tajikistan has witnessed remarkable progress in reducing poverty and expanding its middle class, particularly in the post-COVID-19 pandemic era. The pre-COVID-19 period saw a gradual increase in the middle class, which accelerated significantly post-COVID-19 pandemic. The country's middle class grew from an initial 8 percent in 2010 to an impressive 33 percent in 2023, indicating robust poverty reduction and a substantial rise in economic mobility. Urban areas have experienced rapid growth in the middle class, from 28 percent in 2021 to 46 percent in 2023. Although the rural middle class also expanded, the increase was more modest. Regional disparities were notable, with Dushanbe showing the highest upward mobility. The overall progress has been driven by urbanization and increased remittances. However, challenges remain, including high dependency on remittances and limited growth in high-skilled employment.

Middle-class households have fewer dependents, better labor-market resources, and are primary owners of assets. Education plays a crucial role, with middle-class individuals being significantly more educated, which could translate to better employment opportunities and higher income levels. Middle-class households exhibit higher labor market participation rates, with a notable employment in the private sector. There is a significant shift toward medium- and high-skilled jobs, and employment in non-agricultural sectors, contributing greatly to growth of the middle class. International remittances play a vital role in the economic well-being of the middle class. Middle-class households are primary owners of durable assets, indicating better financial stability and access to resources.

There is considerable economic class mobility and labor market resources play a pivotal role in middle-class growth. Economic class mobility is significant, with many households progressing up the economic ladder. Specifically, 51 percent of households remained in their initial classes, 35 percent climbed up, and 15 percent slid down. Rural areas experience higher downward mobility compared with urban areas, with Dushanbe showing the highest upward mobility. Growth contributed 12.8 percentage points to the middle-class expansion, while redistribution offset it by 3.5 percentage points. Labor income and transfers are the primary drivers of middle-class growth, with labor income from the services and industry sectors being particularly impactful. Households transitioning from low- to medium- or high-skilled jobs see significant middle-class growth, while regressive transitions result in lesser increases. Middle-class stability is strongly linked to post-secondary education and modern employment avenues.

Fostering and sustaining middle-class growth requires a multifaceted approach. Policy makers should implement targeted interventions to address the specific needs of different economic classes, promote education and employment opportunities, and leverage migration and remittances for sustainable economic advancement. The following policy recommendations are proposed to aid Tajikistan in building on its achievements, and sustaining and further enhancing growth of the middle class to create a more resilient, equitable, and prosperous society.

- 1. Promoting Education and Skill Development:** Investing in (post-secondary) education and vocational training programs is essential to equip individuals with the skills required for medium- and high-skilled jobs and upward occupational transitions. Enhancing access to quality education, particularly in rural areas, will bridge the gap between economic classes and empower more individuals to join the middle class.

2. **Strengthening Labor Market Policies:** This includes implementing labor market policies that promote fair wages, job security, and employment benefits. Policy efforts should focus on creating more high- and medium-skilled job opportunities, particularly in urban areas. Enhancing labor rights and protections will improve working conditions and encourage greater participation in the workforce, particularly for women and vulnerable groups. Incentives for the industry and services sectors to generate employment can drive middle-class growth.
3. **Encouraging Private Sector Growth:** Facilitate the expansion of the private sector through regulatory reforms and incentives to attract investments and create job opportunities. Fostering entrepreneurship and supporting small and medium enterprises (SMEs) will drive economic diversification and reduce reliance on remittances. Encouraging policies that create more private sector job opportunities, particularly in medium- and high-skilled occupations, would help sustain middle-class growth.
4. **Enhancing Social Protection Programs:** Strengthening social protection programs and expanding access to health care, housing, and social services will improve the overall quality of life and provide a safety net for those at risk of falling back into poverty and reduce economic disparities. Targeted interventions in rural areas to reduce downward mobility through agricultural development programs, diversification of income sources, and increase asset ownership are necessary to enhance economic resilience and the quality of life.
5. **Leveraging Remittances for Development:** Developing strategies to maximize the impact of remittances on economic development is crucial. Encouraging productive use of remittance funds, such as investments in education, health care, and entrepreneurship, will enhance their contribution to middle-class growth and stability. Strengthening international labor agreements and easing remittance processes can sustain the middle-class growth driven by migration. Financial literacy programs for recipients can optimize the use of remittances for investments.
6. **Supporting Regional Development:** Addressing regional disparities by investing in infrastructure and development projects in underserved areas help reduce economic inequalities and promote upward mobility, especially in rural areas and regions with lower economic growth. Promoting balanced regional development will ensure that all citizens have access to economic opportunities and resources, fostering inclusive growth across the country.

Future Outlook

Looking ahead, Tajikistan's middle class is poised for continued growth and achieve the ambitious targets set forth in the National Development Strategy, provided that the country can address its existing challenges and leverage its strengths. Global economic conditions, such as fluctuations in remittance flows and international labor markets, will play a crucial role in shaping the future of Tajikistan's middle class. Policy makers must remain vigilant and adaptable to external factors to sustain and enhance middle-class growth, ensuring a resilient and prosperous society for all.

Annex A.

Additional Results

Table A.1. Profile by socioeconomic groups

		Poor	Vulnerable	Middle class
Demographics	Head age (years)	56.1	57.3	57.4
	Female headed	16%	22%	28%
	Age dependency ratio	79.9	82.1	67.9
	Household size	6.9	7.0	6.3
Education	Members with no education	30%	16%	4%
	Members with primary education	15%	16%	16%
	Members with secondary education	49%	58%	65%
	Members with post-secondary education	6%	10%	14%
Labor market	Employment (working age)	29%	41%	51%
	Employment in high skill occupation	16%	15%	18%
	Employment in medium skill occupation	43%	56%	54%
	Employment in low skill jobs	40%	28%	27%
	Employment in private sector	31%	42%	54%
Housing	Inadequate housing materials (floors/walls)	49%	40%	31%
	Improved sanitation	94%	94%	90%
	Safe drinking water	86%	88%	88%
	Electricity access	71%	74%	76%
Assets	Mobile phone	88%	91%	92%
	Television	77%	86%	92%
	Refrigerator	52%	65%	77%
	Car/truck	11%	20%	32%
	Stove/oven	72%	82%	89%
	Washing machine	20%	34%	54%
Weather shock and market access	Drought (frequency)	14.5	13.9	12.5
	Heat stress experience	19%	17%	9%
	Distance to nearest main market (Km)	26.2	23.4	21.5

Source: World Bank staff calculations based on HBS 2021–2023

Notes: Mean or proportion difference test is conducted comparing the poor and vulnerable against the middle class; There are no statistically significant differences in the mean value of the following variables across the groups compared (middle-class vs. vulnerable): members with secondary education, employment in low skill jobs, and electricity access. (i) Housing materials are quality materials if the main material is not poor: floor (mug/dung, bamboo/reed/wood planks); roof (thatch, wood and mud, bamboo/reed, plastic cover), or walls (wood and mud, wood and thatch, wood, stone, stone and mud, blocks (unplastered), parquet or polished wood, chip wood, bamboo/reed, plastic). (ii) Improved source of drinking water means piped water, a protected well/spring, or rainwater collection. Improved sanitation means a flush toilet, an improved pit latrine, or compost that is not shared with households. Results are based on data from only one quarter (quarter 4 for 2021 and 2022 and quarter 1 for 2023). (iii) Weather data are extracted using geocodes in HBS 2023 that allow merging data at the enumeration area (EA) level. Rainfall data are from CHIRPS (1981 - 2023) <https://data.chc.ucsb.edu/products/CHIRPS-2.0/>. Temperature data are from the Climate Research Unit (CRU) <https://crudata.uea.ac.uk/cru/data/temperature/>.

Annex B.

Approaches to Measuring Economic Security

B.1. López-Calva and Ortiz-Juarez (2014) approach

The empirical framework proposed by López-Calva and Ortiz-Juarez (2014) is used to define the middle class in Tajikistan based on households' vulnerability to poverty. This framework is increasingly used to define the middle class with available panel data. The approach is rooted in Sen's (1983) argument, which emphasizes "capabilities" rather than just income or commodities in defining poverty. Sen's perspective suggests that an absolute approach to poverty in terms of capabilities translates into a relative approach in terms of commodities. This method, rooted in economic security, utilizes panel data to identify households with a limited risk of falling into poverty, qualifying them for middle class status. The middle-class lines derived from this approach can be considered absolute in the sense that they translate to a monetary value classifying households into different economic classes, independent of the income distribution. The methodology comprises three stages.

- **Stage 1: Identification of poverty transitions:** Construct poverty transition matrices from the HBS panel data using the national poverty line of SM 14.96 per person per day. This helps identify characteristics associated with movements in and out of poverty during the period under consideration.
- **Stage 2: Probability estimation:** Estimate the probabilities of households falling into poverty between an initial period of time and a final period of time. With the availability of more frequent panel data, several definitions of falling into poverty could be considered by exploiting the full panel data.
- **Stage 3: Consumption level estimation:** Determine the consumption level associated with these probabilities, yielding a monetary estimate of the lower threshold for the middle class. The resulting consumption per adult value, used as the lower threshold in the middle-class definition, is then applied to cross-sectional data to measure the size of this economic group for the period under consideration. The steps followed are discussed in detail below.

The crucial step in applying this methodology is defining poverty transition. The transition tracks the same households over two periods and compares their status and probability of remaining in or moving out of poverty and provides an assessment of the extent of poverty persistence. As highlighted by López-Calva and Ortiz-Juarez (2014), the idea behind calculating actual transitions is to summarize permanent income by regressing consumption on assets and various socio-economic characteristics, which serve as proxies for different assets. The basic argument is that a household's ability to cope with shocks depends not only on their actual income but also on their wealth and ability to manage risks.

In the second stage, the information from the poverty transition matrix is used to construct a model identifying the correlates of falling into poverty over the two periods. For this purpose, a logistic model is estimated to predict the probability of falling into poverty.

The vulnerability index can be determined using a probability model of the following form:

$$\Pr(\text{poor}_{i,t+1} = 1 | x_{it}, \beta_{\text{poor}}) = F(x'_{it} \beta_{\text{poor}}) \quad (1)$$

where $\text{poor}_{i,t+1}$ is a limited dependent variable taking the value of 1 if the household is identified as poor in both periods (always poor) or falls into poverty in the second period ($t + 1$), and 0 otherwise. β_{poor} is a $(K \times 1)$ vector of the parameters to be estimated, x'_{it} is a $(1 \times K)$ vector of covariates, and $F(\bullet)$ is a function linking the probabilities with the covariates such that $\Pr[\text{poor}_{i,t+1} = 1 | x_{it}, \beta_{\text{poor}}] + \Pr[\sim \text{poor}_{i,t+1} = 1 | x_{it}, \beta_{\text{poor}}] = 1$. The function initially chosen for the present analysis is the logistic cumulative function. The covariate vector is composed of observable characteristics, including household demographics (such as household size, composition, gender, age, education, employment of household head, marital status of the head), asset ownership, housing quality, access to basic services, whether the household receives remittances from local or international sources, rainfall and temperature variability or shocks, and location variables (such as rural residence and region) in the initial period. These covariates included capture the different dimensions of assets or capital discussed in the conceptual framework. The model also accounts for changes between t_1 and t_0 in the number of household members employed, household size, and nonlabor income shock measured as change in nonlabor income.

In the next stage, a consumption model is built to isolate the structure of consumption. This involves estimating the household's per adult consumption equation using the same set of independent variables as in the previous model. The dependent variable in this estimation is the natural logarithm of the household's per adult consumption for the initial time period. The model estimated is:

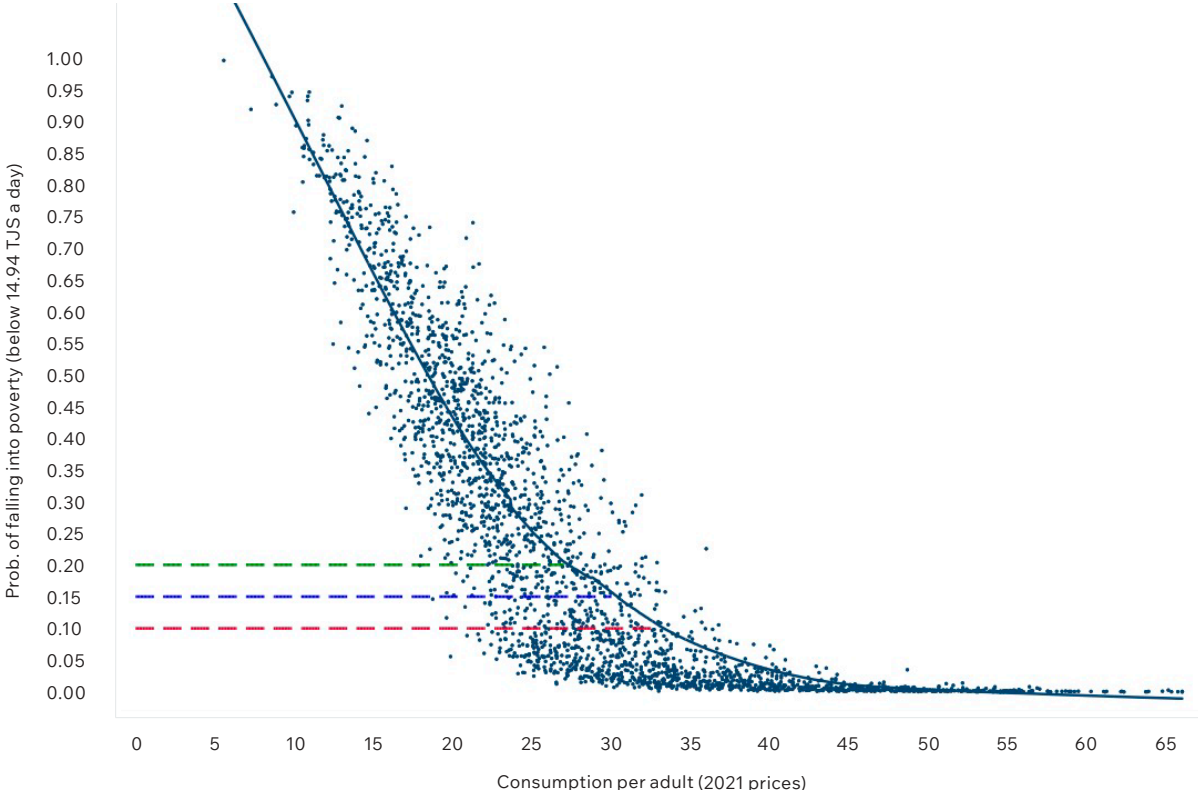
$$Y_{it} = x'_{it} \theta + \varepsilon_i \quad (2)$$

where θ is the $(K \times 1)$ vector of parameters to be estimated, and x'_{it} is the same $(1 \times K)$ vector of covariates defined above. The consumption equation is estimated using ordinary least squares (OLS) with the usual assumptions (Table A.2 provides a summary of the regression results). Next, we calculate the average of the independent variables for an array of estimated probabilities of falling into poverty. The resulting coefficients from the consumption equation (the estimated coefficients θ) and the mean values for the independent variables are used to retrieve the expected per adult consumption value. The predicted consumption—a mean, conditional on characteristics—is used instead of the observed average consumption because the predicted consumption has lower volatility and serves as an index related to stocks (assets), reflecting the income generation capacity of households (Corral et al., 2019; López-Calva & Ortiz-Juarez, 2014). Figure B.1 shows the relationship between consumption and the probability that households with those levels of predicted consumption would fall into poverty in the final period.

Following the consensus in the literature, the consumption threshold associated with the 10 percent likelihood of falling into poverty is used as the lower bound for the middle-class line.

As the middle class, ideally, should consist of those households facing a low risk of falling into poverty over time, a 10 percent probability of falling into poverty is applied as a dividing line between economic security and vulnerability. The predicted consumption associated with that probability defines the lower threshold that depicts the lower bound of the middle class (Figure B.1). The selection of a probability of 0.10 is based on the empirical work by Cruces et al. (2015) that using synthetic panel showed that on average 10 percent households every year in a 15-year period fall into poverty. While this threshold seems somewhat arbitrary like any poverty line, it is derived from a well-defined concept of economic security — the stability and predictability of income and employment, which reduces the risk of falling into poverty, which can be made operational for specific contexts (López-Calva & Ortiz-Juarez, 2014).

Figure B.1. Daily consumption by probabilities of falling into poverty



Source: Based on TJK HBS 2021–2023
Notes: The middle-class lower thresholds for three probabilities of falling into poverty thresholds are: 33.32 for 10%, 30.36 for 15 percent, and 27.32 for 20 percent. The threshold at 10 percent probability level is about twice the national poverty line.

Vulnerability to poverty is minimized when people attain consumption of at least 2.23 times the national poverty line. The statistical modeling results using the HBS panel data show that SM 33.32 per adult per day is the minimum consumption level associated with a 10 percent risk of falling into poverty over a three-year period, hence is used as the middle-class line in Tajikistan. Tracking the same households across time shows that 3.5 percent of households consuming at least this much in 2021 fell into poverty at least once between 2022 and 2023. Further analysis indicates that the vulnerability to poverty is lower at higher thresholds (Figure B.2).

The upper threshold of the middle class — the upper-class line that delineates the middle class from the rich or affluent — is not defined. Once the lower threshold for the middle class is identified, one may be interested in defining the upper-class threshold. One option is to leave the upper bound for the middle class undefined, but this can result in including households that are significantly wealthier than the middle class into the middle class. This is a pragmatic decision because household budget or consumption surveys are well-suited to collect data from the poor and lower segments of the welfare distribution but do not provide accurate information on the richest percentiles (Corral et al., 2019; López-Calva & Ortiz-Juarez, 2014). It is shown that defining the upper threshold is less impactful than the lower threshold because moving the upper threshold up or down the welfare distribution includes or excludes a small percentage of individuals. In contrast, adjusting the lower threshold significantly changes the percentage of the population classified as middle class (Birdsall et al., 2011). In this note, the upper limit of the middle class is left undefined. Here, "middle class" refers to the secure segment of the population, including the rich or affluent (World Bank, 2018a).

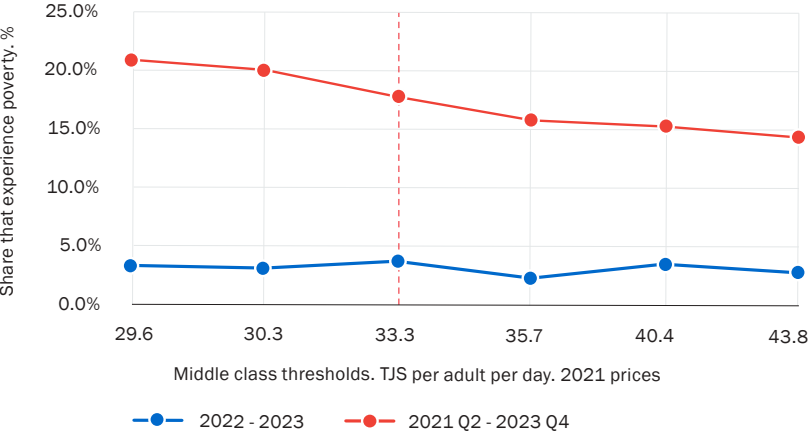
Middle-class thresholds are sensitive to the definition of falling into poverty. The HBS data have quarterly consumption aggregates (and poverty status in each quarter) for households that offers an opportunity to generate alternative middle-class thresholds. By exploiting this quarterly consumption data, poverty experience or falling into poverty can be defined based on annual or quarterly poverty transitions. As discussed above, the preferred definition adopted in this note is poverty experienced during 2021, 2022, and 2023. Middle-class thresholds are included using two alternative definitions (Table B.1). Alternative 2 is based on poverty experience during the period 2021–2023 and falling into poverty or poverty experience is defined by comparing the same household across same quarters in different years (e.g., 2021 Q1 vs. 2022 Q1 or 2023 Q1). When falling into poverty is defined as experiencing poverty anytime in 2022 or 2023 (47.5 percent of the households), the middle-class threshold will be SM 40.40 per adult per day (in 2021 prices), which is equivalent to 2.9 times the national poverty line (Table B.1). Alternative 3, defining falling into poverty as experiencing poverty any time during the 12 quarters (58.8 percent of the households), the middle-class threshold will be SM 43.79 per adult per day (in 2021 prices). The sensitivity analysis results show that the probability of experiencing poverty (at least once) falls with the middle-class threshold (Figure B.2).

Table B.1. Robustness of thresholds to definitions of falling into poverty

Poverty experience definition	Middle class threshold	Relative to poverty line	Middle class size (Share of population, %)		
			2021	2022	2023
Model 1: Poverty experience during 2021 – 2023 (annual)	33.32	2.24	23.8%	30.5%	34.9%
Model 2: Poverty experience during 2021 – 2023 (quarterly)	40.40	2.70	14.8%	21.4%	24.6%
Model 3: Poverty experience during 2021 Q1 – 2023 Q4 (quarterly)	43.79	2.93	11.9%	18.1%	21.1%

Source: World Bank staff calculations based on HBS (2021–2023) data.
Notes: The national poverty line is 14.94 (14.942264 but rounded for ease of exposition) TJS per adult equivalent per day (in 2021 prices). The middle-class thresholds are in TJS per adult per day (in 2021 prices). Model 1: Falling into poverty defined as experiencing poverty anytime during 2021–2023, based on an annual analysis of a balanced sample from about 3,000 households. The analysis involved aggregating the quarterly consumption into annual consumption and recalculating annual poverty status at the household level. A household is considered to have experienced poverty if it was poor at any point within these three years. Model 2: Falling into poverty is defined as experiencing poverty at any point during 2021–2023. This analysis observes the poverty status of the same household in Q1 of 2021, Q1 of 2022, and/or Q1 of 2023. Model 3 defines falling into poverty at the household level using a balanced sample from 3,000 households. A household is considered to have experienced poverty if it has been poor in any of the 12 quarters during the three-year period. The characteristics from the first quarter of 2021 are used as controls in both the poverty and consumption regressions. Control variables in all regressions are from 2021 Q1. Change variables computed using 2021 Q1 and 2023 Q1 data.

Figure B.2. Poverty experience by middle class thresholds: over a year vs. by quarters



Source: World Bank staff calculations based on HBS (2021–2023) data.
Notes: The vertical red line indicates the calculated middle-class threshold of SM 33.32 per adult per day; (i) 2022–2023: poverty experience in 2022/2023 (annual) being in a middle class defined using 2021 average consumption; (ii) 2021 Q2–2023 Q4: poverty experience in any quarter after 2021 Q1 being in a middle class defined using 2021 Q1 consumption.

Table B.2. Determinants of falling into poverty and consumption

	(1) Poverty	(2) Consumption (log)		(1) Poverty	(2) Consumption (log)
Age of the head	-0.02 (0.02)	0.01* (0.00)	Change in household size	0.01 (0.02)	-0.00 (0.00)
Age of head squared	0.00 (0.00)	-0.00 (0.00)	Change in number of employed	-0.01 (0.04)	-0.03*** (0.01)
Male headed	-0.19 (0.13)	0.07** (0.03)	Mobile	-0.41*** (0.12)	0.09*** (0.03)
Married head	-0.29** (0.14)	0.05* (0.03)	TV	-0.06 (0.11)	0.03 (0.03)
Household size	0.11*** (0.02)	-0.06*** (0.00)	Refrigerator	-0.08 (0.08)	0.13*** (0.02)
Members with secondary education	0.06 (0.12)	-0.02 (0.03)	Car or truck	-0.49*** (0.10)	0.11*** (0.02)
Members with post-secondary education	-0.23 (0.21)	0.14*** (0.04)	Gas/electric stove/oven	-0.25** (0.10)	0.16*** (0.02)
Share of adults employed	-0.16 (0.16)	0.06 (0.04)	Washing machine	-0.26*** (0.08)	0.08*** (0.02)
Head in industry	-0.21* (0.12)	0.03 (0.03)	Inadequate housing materials	0.22*** (0.07)	-0.03 (0.02)
Head in services	-0.06 (0.09)	0.02 (0.02)	Improved sanitation	0.07 (0.09)	0.01 (0.02)
hh: couple with 1 child	0.62** (0.29)	-0.23*** (0.06)	Rainfall shock	0.01*** (0.00)	-0.00*** (0.00)
hh: couple with 2 children	0.73** (0.30)	-0.24*** (0.06)	Heat stress	0.07 (0.12)	-0.13*** (0.03)
hh: couple with 3+ children	0.78** (0.30)	-0.22*** (0.06)	Rural dummy	0.01 (0.08)	0.07*** (0.02)
hh: only adults	0.41 (0.30)	-0.15** (0.06)	Constant	-2.17*** (0.70)	3.39*** (0.15)
hh: mixed	0.31 (0.33)	-0.16** (0.06)	Region fixed effect	Yes	Yes
Remittances	0.14* (0.08)	0.06*** (0.02)	Observations	2,523	2,523
			R ²	0.31	0.52

Notes: Dependent variables are the poverty or falling into poverty status of households in logistic model, and the household per adult consumption (log-scale) in linear model. Results are coefficient estimates from logistic (for falling into poverty) and linear (for consumption) regression analysis; Standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01; Pseudo R2 reported for the logit model. Rainfall shock is based on the long-term rainfall standard deviation (1981-2021). Heat stress is defined as a dummy taking a value of 1 if the annual temperature exceeds the 98th percentile of the long-term temperature.

B.2. Chaudhuri (2003) approach

The Chaudhuri (2003) method approximates households' intertemporal welfare variability using cross-sectional variability across households. While it makes certain assumptions, it avoids those necessary for constructing synthetic panels. Its lower data requirements make it applicable in a broader range of cases. Vulnerability, a forward-looking measure of well-being, is defined by a household's consumption prospects at time $t + 1$, unlike poverty, which is an *ex-post* measure. While poverty status is directly observable with the right data, vulnerability is not; it must be inferred from future consumption prospects. To evaluate a household's vulnerability to poverty, we need to consider both inter-temporal and cross-sectional determinants of consumption (Chaudhuri, 2003; Chaudhuri et al., 2002). Vulnerability depends on household characteristics and the stochastic properties of its consumption stream, including expected consumption and its variance. This is based on the assumption that observed consumption expenditures from a single cross-section survey reflect a dynamic process, necessitating models of intertemporal household behaviour.

The following regression specification specifies the stochastic process generating the consumption of a household h :

$$\ln Y_h = \alpha + \mathbf{X}_h \beta + \varepsilon_h \quad (1)$$

where Y_h is the per adult equivalent consumption expenditure of household h , $\mathbf{X}_h$ is a vector of observable household characteristics (such as household size), household assets (e.g., quality of the dwelling materials, ownership of cell phone, durables, etc.), location (rural/urban and region), characteristics of household head (such as age, education, gender, marital status, and employment), education of members, share of adults employed, access to basic services (e.g., sanitation, electricity), remittances, and weather variability (rainfall and temperature shocks); β is a vector of coefficients to be estimated; and ε_h is the error term (with mean zero) which captures idiosyncratic shocks that affect household's per capita consumption expenditures, i.e., contribute to differential welfare outcomes for households that are otherwise observationally equivalent. Equation 1 is estimated using Ordinary Least Squares (OLS).

Within this framework, the variance of the disturbance term ε_h (cross-section variability) is interpreted as the inter-temporal variability of consumption expenditure. Therefore, it is important to allow for this variance to depend on household's characteristics. This is done by specifying the following functional form:

$$\sigma_{\varepsilon,h}^2 = \mathbf{X}_h \theta \quad (2)$$

A three-step Feasible Generalized Least Squares (FGLS) procedure (Amemiya, 1977) is used to estimate θ and β . First, we estimate equation (1) using OLS and used the estimated residuals from equation (1) to estimate:

$$\hat{\varepsilon}_{OLS,h}^2 = \mathbf{X}_h \theta + v_h \quad (3)$$

The predictions from equation were used to transformation equation as follows:

$$\frac{\hat{\varepsilon}_{OLS,h}^2}{\mathbf{X}_h \hat{\theta}_{OLS}} = \left(\frac{\mathbf{X}_h}{\mathbf{X}_h \hat{\theta}_{OLS}} \right) \theta + \frac{v_h}{\mathbf{X}_h \hat{\theta}_{OLS}} \quad (4)$$

The transformed equation (4) is estimated using OLS to obtain an asymptotically efficient FGLS estimate, $\hat{\theta}_{FGLS}$. $\mathbf{X}_h \hat{\theta}_{FGLS}$ is a consistent estimate of the variance of the idiosyncratic component of consumption expenditure, $\sigma_{\varepsilon_h}^2$. The standard deviation of the variance of the error component, $\hat{\sigma}_{\varepsilon_h} = \sqrt{\mathbf{X}_h \hat{\theta}_{FGLS}}$, is used to transform equation (1) to account of the inefficiency of OLS as follows:

$$\frac{\ln Y_h}{\hat{\sigma}_{\varepsilon_h}} = \frac{\mathbf{X}_h}{\hat{\sigma}_{\varepsilon_h}} \beta + \frac{\varepsilon_h}{\hat{\sigma}_{\varepsilon_h}} \tag{5}$$

The OLS estimate of equation (5) denoted as $\hat{\beta}_{FGLS}$ yield a consistent and asymptotically efficient estimate of β . Using $\hat{\beta}_{FGLS}$ and $\hat{\theta}_{FGLS}$ we directly estimated the expected log expenditure and variance of log expenditure for each household as:

$$\hat{E}[\ln Y_h | \mathbf{X}_h] = \mathbf{X}_h \hat{\beta} \tag{6}$$

and

$$\hat{V}[\ln Y_h | \mathbf{X}_h] = \hat{\sigma}_{\varepsilon_h}^2 = \mathbf{X}_h \hat{\theta} \tag{7}$$

By assuming that consumption (Y_h) is log-normally distributed, we use the estimates to form an estimate the probability that a household with the characteristics, $\mathbf{X}_h$, will be poor. We then estimate the households' vulnerability level using the properties of the normal distribution as follows:

$$v_h = \widehat{Pr}(\ln Y_h < \ln z | \mathbf{X}_h) = \Phi \left(\frac{\ln z - \mathbf{X}_h \hat{\beta}}{\sqrt{\mathbf{X}_h \hat{\theta}}} \right) \tag{8}$$

where $\Phi(\cdot)$ is a cumulative density of the standard-normal and is the national poverty line.

The vulnerability line is then derived as the mean of $\hat{Y}_h$ of non-poor households with a 10% probability of being poor within 1 point of the probability threshold set: and $Y_h > PL$ and $\widehat{Pr}(Y_h < PL) = 10\%$, where PL is the poverty line. We follow the same procedure to derive the economic security line by taking the mean of the consumption of non-vulnerable households with a 10 percent probability of being vulnerable within 1 point of the probability threshold set. The same procedure is applied to drive the lines for three rounds of the survey periods. Since this approach is applied to three rounds of data, we calculate aggregate thresholds by pooling the data with year fixed effects in the regression. The FGLS regressions results for each year and the pooled sample are provided in Table B.3. The Chaudhuri method determines the vulnerability threshold by identifying the monetary value of consumption associated with a ten percent chance of becoming poor. This threshold corresponds to the lower boundary of the middle-class line derived from the panel data approach discussed earlier.

Table B.3. Robustness of thresholds to different model specifications

Model specification	Middle class threshold (TJS per adult per day, 2021 prices)
Chaudhuri (2003) approach using HBS 2021-2023 pooled data	30.33
Chaudhuri (2003) approach using L2Tj data (2023/2024)	35.67

Source: World Bank staff calculations based on HBS (2021–2023) data and L2Tj (2023/24).
Notes: The national poverty line is 14.94 TJS per adult equivalent per day (in 2021 prices). The Chaudhuri (2003) method is based on the cross-sectional pooled HBS data (2021–2023). The Chaudhuri (2003) method using the L2Tj data (2023/2024) includes as controls demographics, education, labor market, housing, and asset ownership.

Table B.4. FGLS regressions to estimate beta and theta

	2021		2022		2023		Pooled	
	Log cons.	Variance of log cons.	Log cons.	Variance of log cons.	Log cons.	Variance of log cons.	Log cons.	Variance of log cons.
Household size	-0.052*** (0.002)	-0.004** (0.001)	-0.051*** (0.002)	0.001 (0.003)	-0.093*** (0.002)	0.008*** (0.002)	-0.065*** (0.001)	-0.007*** (0.001)
Male headed	-0.079*** (0.017)	-0.020 (0.013)	-0.103*** (0.020)	-0.039 (0.025)	-0.161*** (0.018)	-0.047* (0.019)	-0.119*** (0.011)	-0.046*** (0.012)
Head age in years	0.003*** (0.000)	-0.001 (0.000)	0.003*** (0.001)	0.002*** (0.001)	0.007*** (0.000)	0.000 (0.001)	0.004*** (0.000)	0.001* (0.000)
Married head	0.054** (0.018)	-0.012 (0.014)	0.047* (0.020)	-0.006 (0.026)	0.115*** (0.018)	0.047* (0.018)	0.072*** (0.011)	0.010 (0.012)
Members with secondary education	0.076*** (0.017)	-0.061*** (0.014)	0.212*** (0.020)	-0.072** (0.025)	0.242*** (0.016)	0.004 (0.017)	0.171*** (0.010)	-0.036** (0.012)
Members with post-secondary education	0.205*** (0.026)	-0.062** (0.020)	0.321*** (0.030)	-0.052 (0.037)	0.412*** (0.025)	0.004 (0.026)	0.304*** (0.016)	-0.038* (0.017)
Share of adults employed	0.188*** (0.019)	0.017 (0.015)	0.341*** (0.023)	0.099*** (0.028)	0.197*** (0.019)	-0.018 (0.020)	0.281*** (0.012)	0.004 (0.013)
Mobile phone	0.176*** (0.020)	0.010 (0.015)	0.159*** (0.023)	0.007 (0.028)	-0.031 (0.021)	0.039 (0.022)	0.094*** (0.013)	0.035** (0.013)
Television	0.092*** (0.018)	-0.007 (0.014)	0.101*** (0.021)	-0.046 (0.026)	0.115*** (0.019)	0.099*** (0.020)	0.096*** (0.011)	-0.024 (0.012)
Refrigerator	0.219*** (0.012)	-0.016 (0.010)	0.206*** (0.015)	0.048* (0.019)	0.095*** (0.014)	-0.073*** (0.015)	0.165*** (0.008)	0.005 (0.009)
Car/truck	0.080*** (0.012)	0.005 (0.009)	0.149*** (0.015)	-0.039* (0.019)	0.222*** (0.014)	0.017 (0.016)	0.150*** (0.008)	0.010 (0.009)
Inadequate housing materials	-0.110*** (0.011)	0.021* (0.008)	-0.100*** (0.013)	-0.033* (0.017)	0.004 (0.013)	-0.067*** (0.014)	-0.075*** (0.007)	-0.019* (0.008)
Improved sanitation facility	0.169*** (0.014)	0.044*** (0.011)	0.210*** (0.019)	-0.037 (0.023)	-0.065*** (0.014)	-0.029* (0.014)	0.047*** (0.009)	0.008 (0.009)
Long term rainfall standard deviation	-0.004*** (0.000)	-0.000** (0.000)	-0.004*** (0.000)	-0.001* (0.000)	-0.004*** (0.000)	-0.000 (0.000)	-0.004*** (0.000)	-0.000 (0.000)
Heat stress	-0.039* (0.019)	-0.110*** (0.015)	-0.139*** (0.023)	-0.176*** (0.028)	-0.086*** (0.019)	-0.091*** (0.021)	-0.097*** (0.012)	-0.114*** (0.013)
Rural	0.061*** (0.012)	-0.020* (0.009)	-0.027 (0.014)	0.061*** (0.017)	-0.017 (0.014)	0.131*** (0.014)	0.009 (0.008)	0.054*** (0.008)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	-	-	-	-	-	-	Yes	Yes
Constant	3.325*** (0.053)	0.444*** (0.040)	3.646*** (0.064)	0.336*** (0.079)	3.982*** (0.056)	0.166** (0.059)	3.551*** (0.034)	0.265*** (0.037)
Observations	11,270	11,270	11,539	11,539	10,488	10,462	33,297	33,297
R²	0.35	0.02	0.30	0.01	0.34	0.03	0.31	0.02

Notes: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Climate Shocks, Access to Infrastructure and Poverty in Tajikistan

A background paper for Chapter VI.
Deep-dive: Poverty and Distributional Implications
of Climate Change in Tajikistan

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1. Introduction

Agriculture employs the greatest proportion of workers in developing countries. Consequently, relative to rural non-farm economic activities, farming is the most effective strategy for reducing poverty (Ngoma et al. 2019). In rain-fed settings, climate change has overarching importance in hamstringing poverty alleviation efforts (Chonayabashi et al. 2020; Hertel and Rosch 2010; Christiaensen, Demery, and Kuhl 2011; Thurlow, Zhu, and Diao 2012; Hallegatte et al. 2016) through diminished crop production (Alfani et al. 2019). Agriculture in Tajikistan relies on irrigation for the most part, but increasing episodes of drought (for example) may adversely affect levels of dams and other water reservoirs, leading to crop failure. The frequency of occurrence of adverse climatic events is likely to increase (Zhou et al. 2022), posing a growing threat to poverty eradication (Hallegatte et al. 2014), including for Tajikistan.

1.1 Tajikistan Overview

Without interventions, climate change will pose significant risks to many developing countries (Burns et al. 2021). Importantly, the effects of climate shocks on poverty are context specific (Leichenko & Silva 2014), and it is therefore important to describe the poverty, climate and access to markets (infrastructure) situation in Tajikistan. About 75 percent of Tajikistan's population resides in the countryside and depend on agriculture for sustenance (Barbone et al. 2010), which creates food security (consumption) challenges given the vulnerability of farming to climate change (Babu et al. 2024). The country ranks highest among those countries most susceptible to climate change, yet it is characterized by weak climate adaptation capacity (Khakimov 2019). Specifically, the country is ranked 64th out of 191 countries in the INFORM 2019 Index for Risk Management (World Bank 2021). It faces the risk of experiencing a plethora of climate-related calamities, resulting in infrastructure collapse, soil erosion and land degradation owing to extreme events such as mudslides (World Bank 2024), as well as earthquakes, landslides, droughts, flooding and health emergencies (epidemics) (Khakimov 2019; Barbone et al. 2010). Hence, the effects of an increasing frequency of climate-related events may be more profound in the country where, even in the projected “no climate change” scenario, stronger economic growth will not necessarily usher society into prosperity (World Bank 2024). Realistically, the climate-related disasters are likely to worsen and we find it imperative to develop a fuller understanding of the short- and long-term ex-post effects of climate shocks.

The effects of climate change are cross-cutting; they straddle the health (GIZ 2020), farming and water sectors (Khakimov 2019). With reference to heat stress, for example, they increase the risks of high morbidity and premature death through dehydration (mainly for outdoor workers) [U.S. Centers for Disease Control and Prevention (CDC) (2025)] and also heightened the probability of the spread of infectious diseases, adversely affecting labor supply (World Bank 2024). We therefore include several climate variables (excessive rain, extreme cold, heat stress and drought) to obtain a better view of how different climate-related events affect welfare in both the short and the long term.

The extent to which communities are affected by climate-related shocks varies across space. Out of the five regions of Tajikistan, Khatlon Oblast, the Regions of Republican Subordination (RRS) and Gorno-Badakhshan (GBAO) will be worst affected, with Dushanbe and Sughd being less affected owing to their relatively more developed industrial base (World Bank 2024).

1.2 Study Contribution

First, recent advancements in geographical and space sciences have resulted in the proliferation of climatic datasets. Considering drought, for example, researchers can choose from a multitude of datasets, making decisions based on the merits and demerits of each dataset. Having selected the right dataset, it is imperative to make further decisions on whether to focus on repeated occurrence of drought (long term) or to consider the short-term dynamics (effects of the previous season's drought on present consumption, for example). This study gathers numerous datasets for different climatic variables (drought, heat stress, excessive rain) and selects the variables of focus based on statistically significant bivariate regression coefficients that meet a priori expectations. In that sense, the study proceeds in a more rigorous, scientific way. Second, the study takes advantage of different waves of the Tajikistan HBS panel to estimate the causal effect of drought and other climate-related shocks on poverty in rigorous quasi-experimental analytical fashion [Difference-in-Differences (DID)]. Lastly, given that the slope of climate-related effects varies depending on an observation's position on the distribution, we explore heterogeneity using distance to market/road and altitude channels, as well as also disaggregating results by geography and welfare quintile.

2. Literature Review

Within the context of developing countries such as Tajikistan, household per capita consumption is normally adopted as the welfare metric. As a result, the literature considers the factors affecting poverty and/or household consumption to be the same. To understand the transition into and out of poverty, Hallegatte et al. (2014) propose that assets, opportunities, prices and production are important channels affecting household consumption. This brief literature section discusses factors affecting welfare under the broad themes suggested by Hallegatte et al. (2014) and then presents a conceptual framework.

2.1 Factors affecting household welfare

2.1.1 Production Channel

In developing countries, the majority of the population resides in rural areas and draws their source of sustenance from farming (Ogundipe et al. 2017). Against this background, rural areas constitute a disproportionately larger share of the poor (Alkire et al. 2014). Hence, the association between poverty and agriculture/rurality is evident. That said, some discussion of the direct mechanisms through which agriculture production influences poverty is important.

Agriculture, economic growth and poverty are inseparable. The classical two-sector model portrays agriculture as a surplus producing sector that facilitates growth through the transfer of labor to the modern, industrialized sector (Lewis 1954; Harris & Todaro 1970). Beyond the two-sector generalization farm employment, farming-rural economy linkages and an economy-wide decrease in the real cost of food are the channels through which agricultural productivity and poverty are linked (Schneider & Gugerty 2012; Thurtle et al. 2001).

Based on the preceding discussion, growth in agriculture productivity can stimulate a decline in poverty incidence. However, in the real world adverse climatic and other shocks can pose significant risks. Therefore, areas that are frequently affected by drought, flooding, heat stress and other environmental/biophysical stresses are likely to experience reduced agriculture productivity, leading to a rise in poverty.

2.1.2 Assets Channel

Endowments in physical assets (savings, land, farm equipment and others) and human capital are associated with a lower likelihood of poverty (Searle & Koppe 2014; Naschold 2012). The association between assets and welfare is significant (Kamal 2014) and, as such, a positive relationship between household asset endowments and welfare may be expected. While physical assets are crucial, other endowments such as human capital allow household members to work in high return jobs/sectors. Ng & Song (2023) find that higher human capital increases the chances of landing job interviews, and ultimately a job. In that sense, higher human capital may lead to employment in sectors that reward better.

At the same time, migrant remittances may also serve as important assets for households in coping against the effects of climate and other shocks. Using a panel of 10 Asian developing countries Yoshino et al. (2017) finds that a 1-percent increase in international remittances resulted in a 16-percent dip in severe poverty incidence between 1981 and 2014. Ojeyinka and Ibukun (2024) also confirm the poverty-reducing effect of migrant remittances in a study of 38 countries in Africa, Asia and Latin America over 1990 and 2021. Lastly, a lower household burden (lower household size) may also be associated with higher welfare.

2.1.3 Opportunities Channel

Households have access to different opportunities depending on their location and their endowments (for example, assets, human capital and employment sector). Hence, household opportunities may influence welfare covariately and or idiosyncratically. Despite the rising share of urban poor (Sridhar 2015), rural-urban migration is associated with higher productivity and poverty reduction where labor markets function well (World Bank 2024; Ravallion 2007). Households located in urban areas may generally exploit more opportunities and hence be less poor (Manjengwa & Nyelele 2012) relative to those in rural areas. Hence, the dominant share of poor resides in a rural setting (Alkire et al. 2014).

It is therefore clear that location in an urban or rural setting is an important determinant of welfare, as is location in particular regions of the country. Different regions/districts have different return periods for climatic events/disasters (see discussion in Section 2.1.1). Beyond the risks emanating from the biophysical environment (drought, flooding, heat stress and others), different locations have different levels of access to markets and roads, which translates to differing capability to venture into off-farm activities, for example. Better access to roads can facilitate participation in off-farm work (Gachassin et al. 2010), which highlights the importance of effective transport institutions in increasing connectivity of isolated locations. Whether building good roads in areas where poverty is high, or in areas where economic activities already is a source of contention in transport literature (Sieber & Allen 2016), there is a general consensus on the effects of road access in helping reduce poverty (Sieber & Allen 2016; Gachassin et al. 2010; Anyanwu & Erhijakpor 2009). In Africa, a 10-percent increase in road infrastructure correlates with a 5-percent decline in poverty (Anyanwu & Erhijakpor 2009).

Related to road access, integrating farmers into agriculture markets is crucial in poverty alleviation efforts (Villa et al. 2023). Proximity to markets also plays a crucial role in income growth and poverty reduction by reducing transaction costs, fostering improved farming practices adoption, higher investment on the land, improving access to higher prices off the farm-gate and higher sales volumes (Marion et al. 2024). Better market access also ensures that farmers are able to participate in high value markets (HVMs), which then translates into higher income, household savings and assets (Huka et al. 2024).

2.1.4 Prices Channel

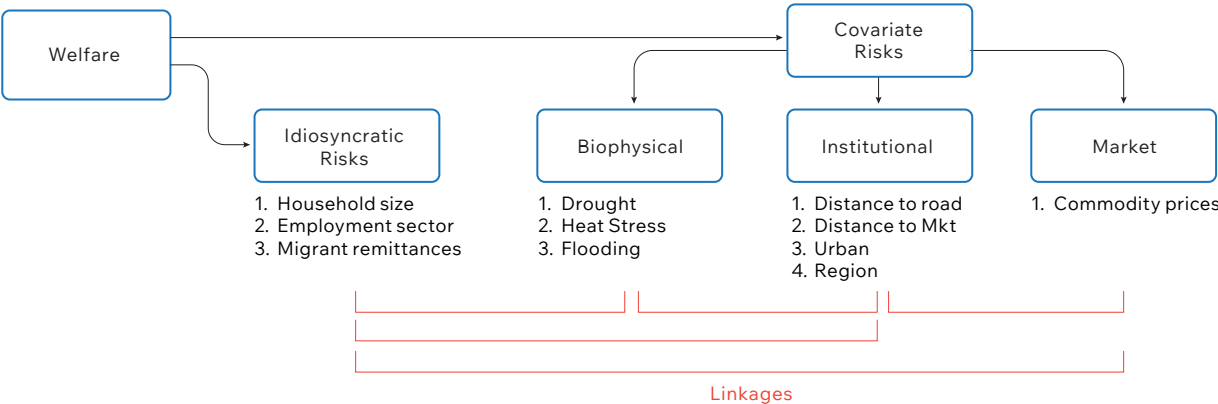
An increase in the price of food triggers inflation and decimates real incomes, pushing households into extreme poverty (Laborde et al. 2019). Abrupt, unexpected increases in prices exert pressure on households because wages/incomes are sticky and seldom large enough to restore the original consumption levels when they eventually rise (IMF 2012). The distributional effects on inequality and poverty depend on whether the household is a net buyer or net seller. If the household produces more than it consumes (net seller), it benefits from rising prices and experiences a surge in income (Laborde et al. 2019) through a positive supply response (Headey & Martin 2016). For net buyers, the effects of price increases are adverse (Laborde et al. 2019).

While Ivanic and Martin (2008) maintain that food price increases more frequently result in poverty increase than reduction, Headey and Martin (2016) argue that complex simulation models and new evidence suggest that growth in agriculture prices have contributed to a tapering-off of poverty since the mid-2000s. However, since Tajikistan is a net buyer/importer of food, particularly wheat, it is highly susceptible to movements in market prices (FAO 2018). As such, the general effect of price increases may be largely negative, particularly in rural areas where prices increases are often disproportionately higher (Faharuddin et al. 2023).

2.2 Conceptual Framework

Based on the literature review, we lay out the study conceptual framework in Figure 2.1. Welfare is a function of covariate and idiosyncratic risks. Idiosyncratic risks include household-specific factors such as size, head employment sector and migrant status. Migrant status is concerned with whether any member of the household works outside the country. The idiosyncratic factors only partly explain household poverty. At the other end of the spectrum, biophysical, institutional and market factors affect households living in the same locality (enumeration area) the same way—they co-vary.

Figure 2.1. Factors affecting household welfare



Source: Own illustration.

Biophysical / environmental stresses such as drought, flooding and heat stress disrupt the agriculture production function, resulting in low yields and consumption. At the same time, institutional disfunctionalities in the form of poor access to markets and roads, and underdeveloped rural areas may mean that net sellers face higher transaction costs to get their produce to market. It may also mean that there are limited non-farm work opportunities to cope with the effects of climatic shocks such as drought, flooding and heat stress. Lastly, prices exert pressure on household budgets and result in less consumption.

Figure 2.1 illustrates that, while the different factors (covariate and idiosyncratic risks), may affect household welfare, linkages do exist between and among them. For example, a rise in food prices may be influenced that incidence of drought (Laborde et al. 2019). At the same time, distance to market may also have a profound effect of household per capita consumption. In essence, the various possible interactions between the individual factors in Figure 2.1 may act as the transmission mechanisms through which shifts in welfare occur.

3. Data and Methods

3.1 Model Specification

The study examines the short- and long-term association between climate shocks and welfare in Tajikistan as follows:

(a) Long Run - Tests the effect repeated exposure to climate shocks on welfare.

(b) Short Term

i. Examines the correlation between experiencing climate shocks in the previous season (2022) on 2023 welfare.

ii. Takes advantage of exogenous selection in experiencing drought in 2022, as well as availability of pre (HBS 2021) and post (HBS 2023) data to investigate the causal effect of drought in a quasi-experimental fashion that allows for difference-in-differences (DID) identification (Lechner 2010; Bertrand et al. 2003). The pre data consists solely of households that experienced drought in 2021 as well, hence the beta coefficients of the DID analysis are interpreted as the causal effects of experiencing two consecutive droughts on welfare.

(c) Interaction Effects - The effects of climate shocks are complex. There are many factors that may exacerbate or mitigate the effects of climate shocks. The study also models how long-term exposure to drought (the main focus of our analysis) and how it interacts with: (i) Distance to markets, and (ii) Altitude as the effects of drought may differ at different points in the distribution of these two intervening factors, creating room for nuanced policy implications as opposed to a one-size-fits-all approach.

The long-run and short-term models that respectively show association between repeated exposure to climate shocks over an extended period and in the previous season are specified in Equations 1 and 2, respectively. In Equation 3, the DID model is used to estimate the causal effects of experiencing drought in 2022, conditional on 2021 drought incidence on 2023 welfare. Lastly, we add interaction effects (distance × longterm exposure to drought, altitude × longterm exposure to drought) in each of the Equations 1 to 3 (not shown).

$$W_i = \beta_0 + \beta_1 \text{shock}_{(1984-2022)} + \beta_2 \text{Area} + \beta_3 \text{Access} + \beta_4 \text{Prices}_{2023} + \beta_5 X + \epsilon \dots [1]$$

$$W_i = \beta_0 + \beta_1 \text{shock}_{2022} + \beta_2 \text{Area} + \beta_3 \text{Access} + \beta_4 \text{Prices}_{2023} + \beta_5 X + \epsilon \dots [2]$$

$$W_i = \beta_0 + \beta_1 \text{shock}_{2022} + \beta_2 \text{Year}_{2023} + \beta_3 \theta \text{shock}_{2022} \times \text{Year}_{2023} + \beta_4 \text{Area} + \beta_5 \text{Access} + \beta_6 \text{Prices}_{2023} + \beta_7 X + \epsilon \dots [3]$$

Where W_i is the welfare metric (per capita consumption in the OLS main estimates and poverty headcount in the Probit robustness estimates),

shock_{2022} is dummy variable on taking values of 1 if the climatic shock occurred in 2022, one year prior the survey and 0 otherwise.

$\text{shock}_{(1984-2022)}$ is a continuous variable that represents the annual count of occurrence, or number of repeat occurrences from the beginning of the data series (1984 in the case of FAO ASI) up to 2022. It captures the long-term dimension of climatic events.

Area represents area level factors such as livelihood zone, region and whether the Enumeration Area is Urban, while

Access is a vector of access to markets/infrastructure variables comprising distance to the nearest market and distance to the nearest road. For the interactions, we also include altitude as one of the factors that may drought differently depending on distribution position.

X is a vector of variables that vary at the household level such as household size, household head employment status and migration.

$\beta_{0...7}$ is the set of regression coefficients while ε is the error term.

For the DID specification (Equation 3) $shock_{2022}$ and $Year_{2023}$ are the *Treatment* and *Post* dummies, while θ is the causal effect - coefficient of interest.

3.2 Variables Description

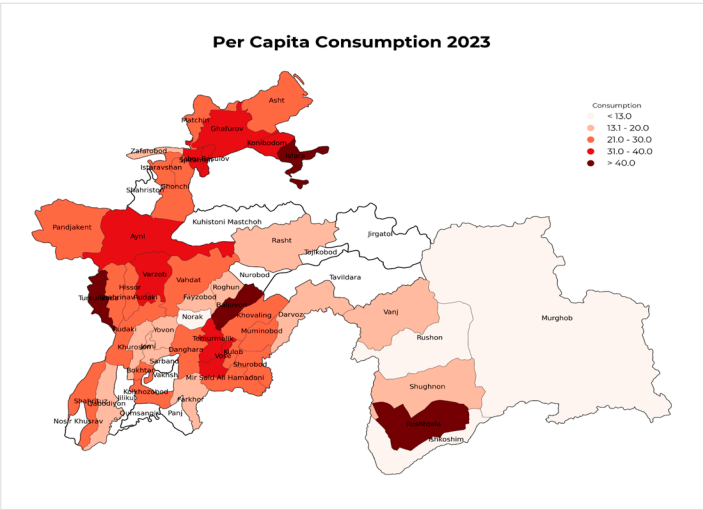
This section discusses the variables that are included in modeling the long- and short-term effects of climate shocks in Tajikistan.

3.2.1 Per Capita Consumption

Unabated occurrence of climate shocks, without mitigation, increases the costs of energy (electricity, coal and heating gas) and disproportionately affects the poor (Babu et al. 2024), as they spend a higher share of their income powering and heating their homes (World Bank 2024). Hence, although poverty is predicted to decline beyond 2030, the occurrence of climate-induced shocks influences a slower tapering off (World Banka 2024). Against this background, climate change is a significant poverty reduction constraint

in Tajikistan (Diagne et al. 2014) and, due to climate-related shocks, poorer districts such as Jirgatal, Tavildara and Tajikobod (**Figure 3.1**) may end up stranded on a much longer path to poverty eradication.

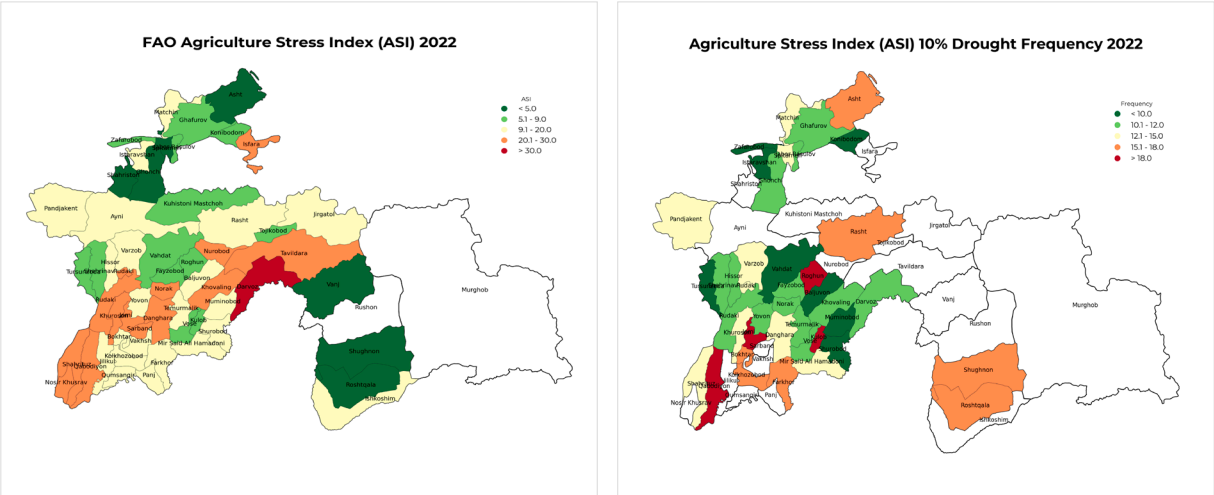
Figure 3.1. Per capita consumption (based on HBS 2023 data)



3.2.2 Drought and Drought Frequency - Agriculture Stress Index (ASI)

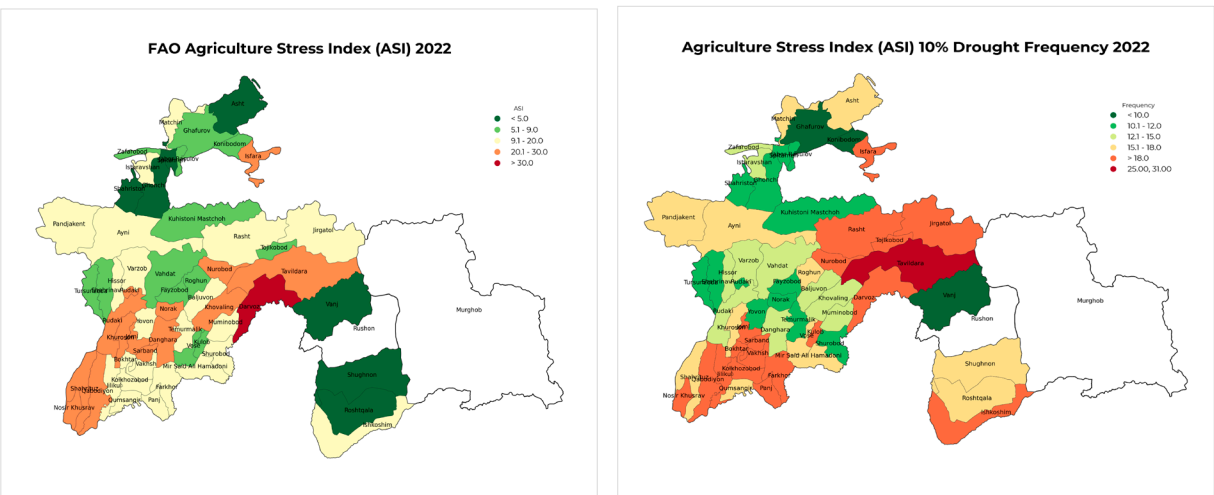
Among different climate shocks, drought poses a significant risk to agro-dependent livelihoods in Tajikistan and, in the absence of adaptation to climate change, the country’s GDP share of agriculture is expected to fall by 1.4 percentage points (World Banka 2024). Seventy-five percent of the population inhabits the countryside and rely on agriculture for sustenance, which makes drought a crucial threat to livelihoods. This study considers the FAO Agriculture Stress Index (ASI) as our main drought measure, and examines its effect on welfare. ASI measures the percentage of land areas affected by drought over crop areas (Rojas 2020; Rojas et al. 2014). Under ASI, drought occurs if the Vegetation Health Index (VHI) is less than 40, whereas the ASI percentage indicates the coverage of the drought. We base our analysis on ASI $\geq$ 10 percent, which means that we define drought incidence is at least 10 percent of the area (in our case EA) was affected by drought analysis.

Figure 3.2. FAO ASI extracted at the EA level



An important quality of FAO ASI is that it is available separately over crop areas and grasslands. Therefore, extracting the data over crop areas returns some missing observations for areas that do not have crops. In that sense ASI is a more precise measure of drought from an exposure point of view. Hence, some districts are missing on the maps shown in Figures 3.2 and 3.3. It should be noted, however, that in Figure 3.2, the data are extracted based on the randomly displaced Enumeration Area (EAs) geocode of the HBS 2023 survey and it would be expected that some districts may not be covered (especially after taking into account the displacement of the geocode). However, even when the FAO ASI data are extracted using the Rayon shapefile, some districts (for example, Murguhb and Rushon) are returning with missing data, as they generally would be devoid of agriculture (Figure 3.3).

Figure 3.3. FAO ASI extracted at the Rayon level

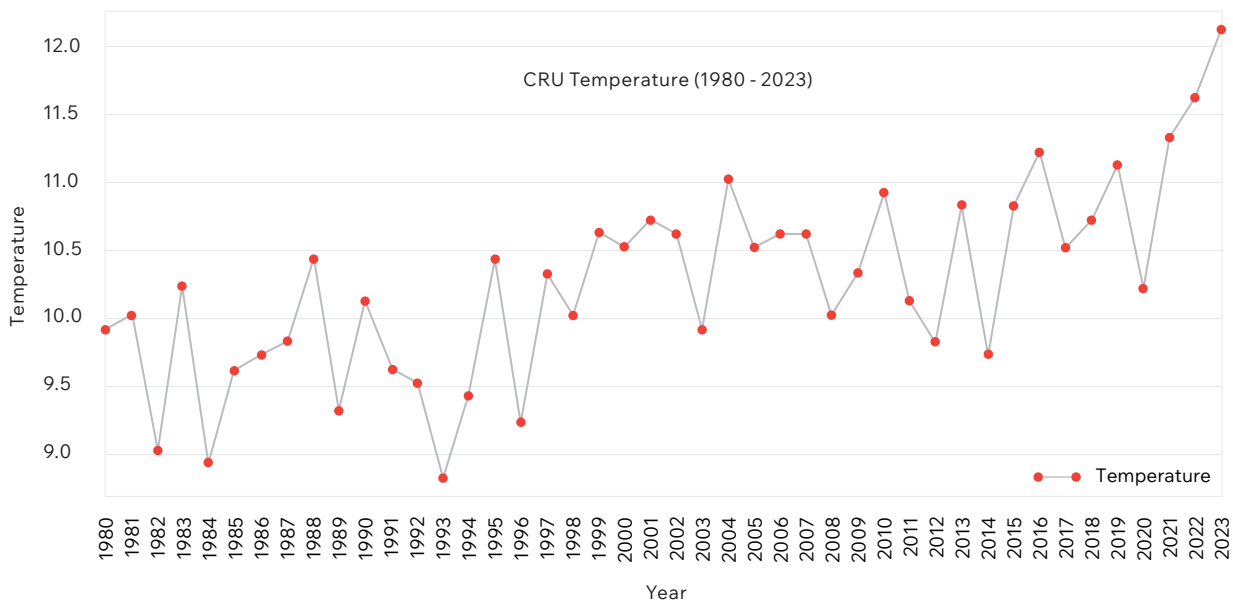


The study adopts the ASI ≥ 10 percent (moderate drought) threshold because it is 'bad enough' if 10 percent of an area is affected drought. Based that reasoning ASI ≥ 25 percent and ASI ≥ 50 percent would be taken as severe and extreme drought, respectively. It would also be a given that when considering a fairly long period of time, ASI ≥ 10 percent would have higher frequency of occurrence than the severe and extreme cases. For robustness, we also consider an alternative drought dataset, Surface Soil Moisture (SSM), whose source and brief description are presented in the Annex.

3.2.3 Temperature

Although this is not the main focus of the work, the study also considers the effects of temperature (in the form of heat stress and extreme cold) on welfare outcomes. Despite yearly fluctuations in average temperatures, Figure 3.4 shows a general increase in temperature in Tajikistan, which may make heat stress an increasing concern. But the estimates of extreme cold and heat stress shown in Annex illustrate that episodes of both temperature extremes are important in explaining welfare to some extent. We define occurrence of extreme cold and heat stress if the season temperature z-score < -1 and $> +1$, respectively. With the exception of shorter time scales, z-scores are standard method using in climatology studies to identify anomalies (Wu et al. 2001).

Figure 3.4. Yearly shifts in temperature



The increase in the number of heat stress events will endanger the health and wellbeing of workers, especially those who work outdoors without adequate cooling amenities [Habibi et al. 2024; International Labor Organization (ILO) 2019]. Temperature rises may lead to low crop yields, heightened risk of flooding, and water supply reduction (Babu et al. 2024). We examine the effects of heat stress on household welfare. Li et al. (2023) and Dear (2011) propose a channel through which extreme cold may adversely affect welfare whereby occupants of cold homes spend disproportionately more on fuel to warm their places of abode. For Tajikistan, it may be likely that households in relatively colder areas spend disproportionately more on fuel, thereby adversely affecting their consumption, as shown in the regression tables in the Annex.

3.2.4 Excessive Rain - Flooding

Tajikistan faces flooding risk, against a background of low coping capacity (World Bank 2021).

Over the past several decades, the country has lost 20 and 30 percent of glacier volume and mass, respectively, resulting in heightened risk of sudden floods (Khakimov 2019). We do not have data on glacier shifts and/floods, but we rely on CHIRPS rainfall data and assume excessive rain occurrence (which may result in flash or riverine floods) if precipitation is above 1 standard deviation of the long-term mean - z-score $> +1$ (Wu et al. 2001; Van der Spuy & Du Plessis 2022). Flood frequency (1981–2022) is presented in Figure 3.5. Areas with other frequency may be associated with less welfare outcomes and investigated in depth in the regressions.

3.2.5 Distance to Markets and Road

Investments in roads, transportation and related infrastructure reduce the transaction costs (Abu, Issahaku & Nkegbe 2016) of accessing markets (Jordaan et al. 2014; Ahmed et al. 2016). This benefits households regardless of whether they are net buyers or net sellers. For net sellers, proximity to markets and easy access to them means that they can obtain better prices that at the farm gate, enhancing their incomes / consumption while for net buyers' proximity and access to markets may imply that they pay lesser prices for goods and services. Distance to market data are obtained from the Global Roads Open Access Data (GROAD), while distance to market data are obtained from the World Food Program (WFP) prices database. The WFP prices dataset provides information on prices of different goods and services from 17 unique markets across different district. Distance to market is the distance from EA to the center of the Rayon in which the market is located.

3.2.6 Prices

WFP provides monthly food and other essentials prices from the year 2002 for Tajikistan and other countries. Based on this, we calculate annual prices for all commodities, fuels, food, non-food items as well wages; based on prices obtaining on the nearest WFP markets (out of 17 in the WFP database). In the regression we add the logged prices of wheat, beef, tomatoes and potatoes as important factors that may confound the association between climate shocks and welfare. The WFP prices data have the advantage of spatial variation as opposed to Tajikistan Consumer Price Index (CPI) data that are not available subnationally.

Figure 3.5. Flood (excessive rainfall) frequency

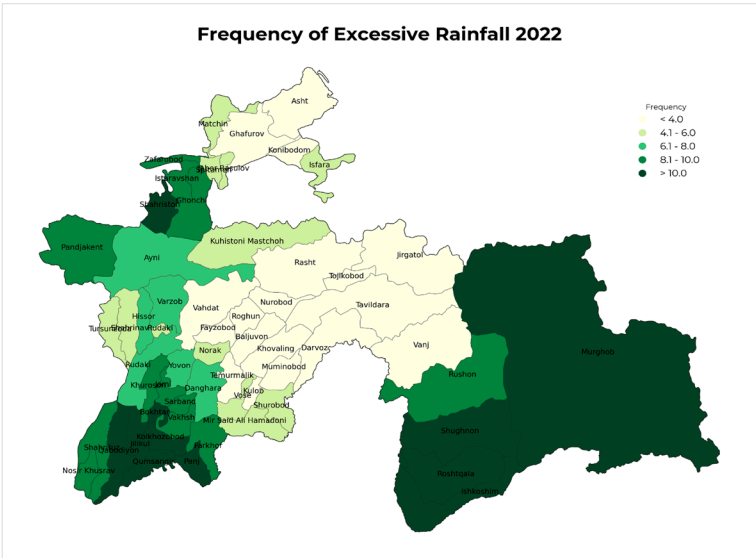


Figure 3.6. FEWSNET livelihood zones

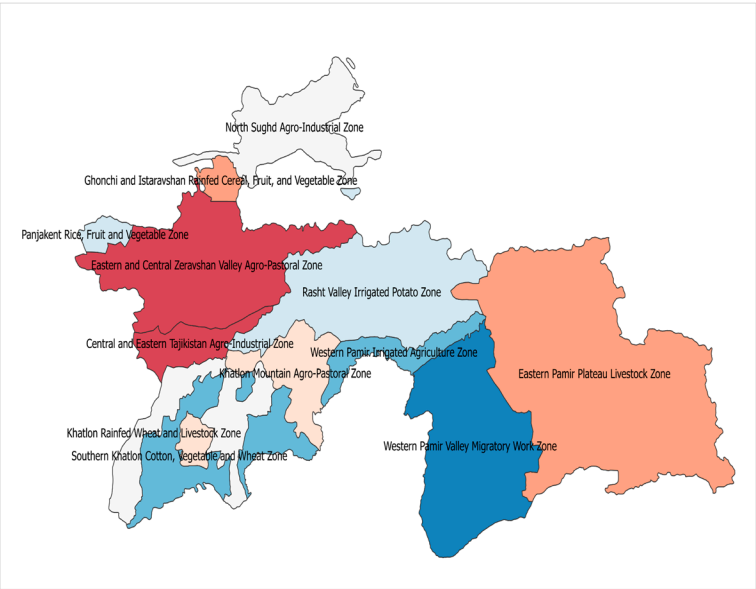
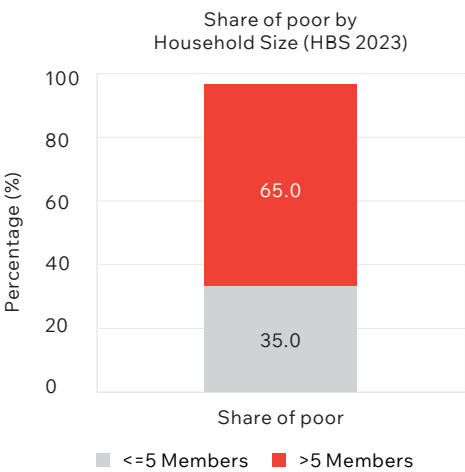


Figure 3.7. Association between household size and poverty



3.2.7 Livelihood Zones

To control for other unobserved variables [fixed effects (FES)], we include livelihood zones in the specifications, based on FEWSNET (2010).

3.2.8 Household Level Factors

The extent to which incidence of climate-related shocks affect household welfare is regulated by risks and factors that are idiosyncratic to households. Against this background, the regressions control for household size, sector of employment of household head, and whether the household has at least one member who migrated outside the country. In Figure 3.7, we show that the greatest burden of poverty lies in large households (those with five or more members). The effects of household-level effects are investigated further in the regressions.

4. Results and Discussion

This section presents the results from the regression analysis. Before the regression results are presented, we begin by showing the summary statistics in Table 4.1. In Table 4.1, Poor has a mean of 0.25, which suggests a poverty headcount of around one-quarter of the population in poverty (although the official figure as at 2023 is slightly less). There is evidence of per capita consumption having a wide range with a minimum of 1.27 and a maximum of 1,466. Beyond the two measures of welfare (per capita consumption and poverty headcount), the table also shows the summary statistics for the climate variables and the rest of the explanatory variables. Our main climate variables are FAO ASI (drought), CRU temperature (for heat stress and extreme cold), as well as CHIRPS rainfall data (flooding). Under ASI, some observations are missing for EAs that are in non-crop areas. For 2022, Table 4.1 shows that almost half of the EAs in Tajikistan experienced drought (FAO ASI ≥ 10 percent). In terms of drought frequency, it ranges between 8 and 23, which means that worst affected EAs encountered drought 23 time (years) between 1984 and 2022.

Table 4.1. Summary Statistics

Measure	N	Missing	SD	Mean	Min	Max
Poor	11,631	0	0.43	0.25	0.00	1.00
HBS 2023 per capita consumption	11,631	0	25.40	26.94	1.27	1,465.29
FAO ASI > 10% (2022)	11,631	1,755	0.50	0.49	0.00	1.00
SSM z-score < -1 (2022)	11,631	0	0.08	0.01	0.00	1.00
Temp > 98 th long term % (2022)	11,631	0	0.33	0.13	0.00	1.00
Temp z-score < -1 (2022)	11,631	0	0.41	3.13	3.00	7.00
CHIRPS Rain z-score > +1 (2022)	11,631	0	2.99	6.94	0.00	15.00
FAO ASI > 10% Drought Freq (2022)	11,631	1,755	3.55	13.11	8.00	23.00
Temp > 98 th % Heat stress Freq (2022)	11,631	0	3.64	1.07	0.00	18.00
Urban	11,631	0	0.50	0.55	0.00	1.00
Distance to Market (WF)	11,631	0	20.74	22.40	0.23	97.35
Distance to Road	11,631	0	5.34	5.35	0.09	61.82
Distance to Local Wheat Market 2023	11,631	0	39.79	47.86	0.86	145.91
2022 First Grade Wheat Price	11,631	0	0.32	6.58	6.18	7.75
2023 First Grade Wheat Price	11,631	0	0.27	5.28	5.10	6.33
2022 High Quality Wheat Price	11,631	0	0.09	6.74	6.64	7.03
2023 High Quality Wheat Price	11,631	0	0.21	5.46	5.32	6.63
2022 Local Wheat Price	11,631	0	0.29	6.29	5.44	7.76
2023 Local Wheat Price	11,631	0	0.31	4.87	4.19	6.19
2022 Mutton Price	11,631	0	4.31	70.43	54.60	75.50
2023 Mutton Price	11,631	0	4.62	71.78	55.38	76.46
2022 Chicken Price	11,631	0	2.70	34.06	29.69	42.82
2023 Chicken Price	11,631	0	2.85	33.54	30.78	43.81
2022 Potatoes Price	11,631	0	0.59	4.26	3.74	7.26

Measure	N	Missing	SD	Mean	Min	Max
2023 Potatoes Price	11,631	0	0.50	5.36	5.07	7.94
2022 Tomatoes Price	11,631	0	1.64	13.03	11.49	20.23
2023 Tomatoes Price	11,631	0	2.17	13.01	11.58	23.07
2022 Onions Price	11,631	0	0.55	4.04	3.70	6.84
2023 Onions Price	11,631	0	0.89	4.65	3.88	7.90
Household Size	11,631	0	2.34	5.26	1.00	18.00
Agriculture	11,631	5,771	0.42	0.23	0.00	1.00
Industry	11,631	5,771	0.38	0.18	0.00	1.00
Services	11,631	5,771	0.49	0.59	0.00	1.00
Migrant Household	11,631	0	0.29	0.10	0.00	1.00
Altitude	11,631	2,892	613.02	795.85	0.00	3933.97

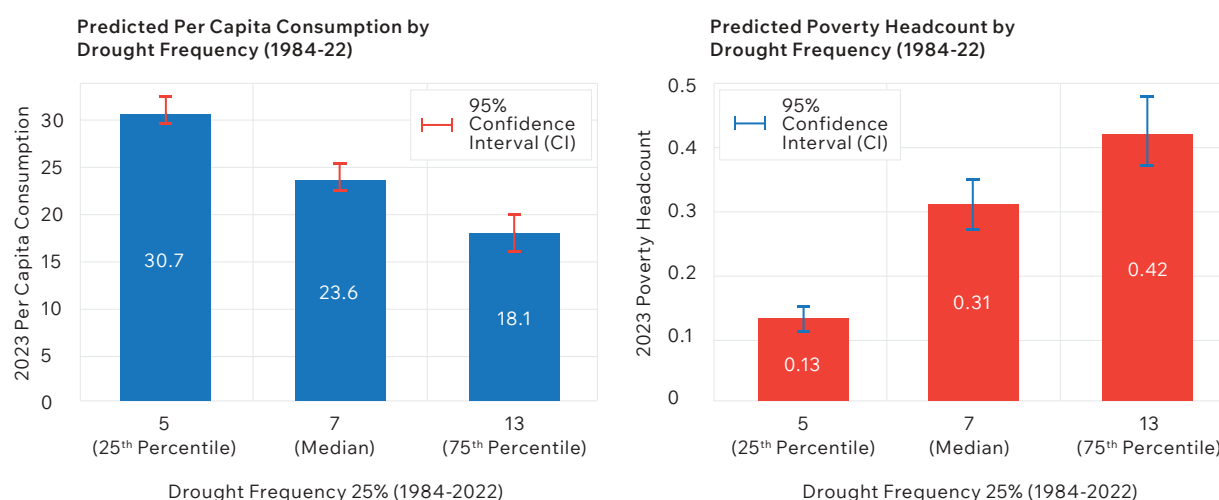
Six observations with below sea level altitude are purged

In terms of temperature, 13 percent of households experienced average temperatures higher than the long-term 98th percentile, heat stress, while over the long term (1980–2022) the maximum repeat occurrence of heat stress was 18, while some EAs never experienced any heat stress episodes at all. In Table 4.1, the average flood frequency (CHIRPS Rain z-score > +1) over 1981–2022 is almost 7, which means that floods occur frequently in Tajikistan.

The study mainly focuses on the effects of drought (based on FAO ASI) and flooding (CHIRPS Rainfall data). Therefore, the results for heat stress and extreme cold are shown in the Annex. Similarly, drought estimates based on SSM are also shown in the Annex, and largely mirror the FAO ASI estimates. In Section 4.1, we present OLS results on the short- and long-term effects of drought and flooding (excessive rainfall) on log per capita consumption. We also implement similar regressions with poverty headcount using the Probit estimator for robustness. Section 4.2 presents difference-in-differences (DID) estimates on the causal effect of drought on per capita consumption, while Section 4.3 presents interaction effects and heterogeneity region and consumption quintile.

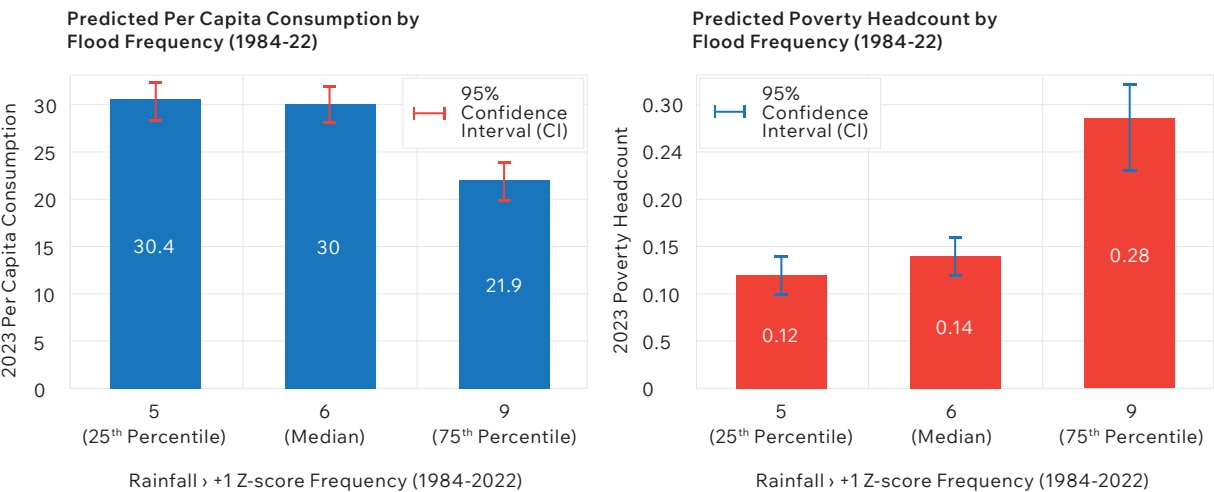
4.1 Main Estimates

Figure 4.1. Predicted poverty by ASI >= 25 percent drought frequency



Based on the long-term estimates of drought and flooding (Tables 4.2–4.6), we present predicted per capita consumption and poverty headcount at the 25th (Q1), 50th (Median) and 75th (Q3) percentiles in Figures 4.1 and 4.2. In Figure 4.1, the regression is based on FAO ASI $\geq$ 25 percent frequency. Based on Figures 4.1 and 4.2, there is evidence that high frequency of drought and flooding is negatively associated with per capita consumption and positively associated with poverty headcount.

Figure 4.2. Predicted poverty by flood frequency



4.1.1 Drought Main Estimates

The regression tables show baseline effects in Column (1), while controls are added progressively. Across all columns we control for Quarter Fixed Effects (FEs), while in Columns (6) – (8) we introduce Region and Livelihood Zone Fixed Effects (FEs). Except for the DID estimates, all interpretations are based on the final model / specification [Column (8)]. In Table 4.2, we present ASI long-run model results, where the coefficient for ASI drought Frequency 1984–2022 is negative and robust across all the specifications. The results [Column (8)] show that an additional year of drought reduces per capita consumption by 4.5 percent.

The coefficient of Urban: Yes is 0.084, significant at 1 percent, which implies that urban areas have 8 percent higher per capita consumption relative to rural areas. The coefficient for Log (Dist to Wheat Mkt) is negative and meet the a priori expectations that households located further away from markets record less consumption and vice-versa. In terms of prices, wheat and beef are inversely associated with consumption as expected, while a positive coefficient is observed for the price of potatoes. This inconsistency may be explained by whether a household is a net buyer or seller on the market. The coefficient of household size is -0.101 and significant at 1 percent, as expected. Adding one member to the household is associated with a 10-percent decline in per capita consumption. The coefficient of migration is not statistically significant for HBS 2023. The results in Table 4.2 show that households whose heads are employed in agriculture, services and industry have per consumption that is higher than 22, 20 and 13 percent relative to those whose heads are unemployed. Therefore, labor market status and sector of employment are important in explaining household welfare. In Table 4.3 the coefficient for ASI drought Frequency 1984–2022 is 0.032 and significant at 1 percent, showing the repeated occurrences of drought increase the log odds of being poor. Hence, the probit estimates check out with their OLS counterparts, and this controls are also robust.

Table 4.2. OLS drought estimates - Agriculture Stress Index (ASI) long-run model

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ASI drought Frequency 1984–22	-0.034 *** (0.002)	-0.034 *** (0.002)	-0.034 *** (0.002)	-0.041 *** (0.002)	-0.037 *** (0.002)	-0.035 *** (0.002)	-0.042 *** (0.002)	-0.045 *** (0.002)
Urban: Yes		0.313 *** (0.011)	0.252 *** (0.012)	0.237 *** (0.013)	0.145 *** (0.012)	0.131 *** (0.012)	0.091 *** (0.011)	0.084 *** (0.011)
Log (Dist to Wheat Mkt)			-0.043 *** (0.006)	-0.119 *** (0.009)	-0.077 *** (0.008)	-0.098 *** (0.012)	-0.066 *** (0.010)	-0.034 ** (0.013)
Log (Dist to Road)			-0.093 *** (0.009)	-0.066 *** (0.010)	-0.010 (0.009)	0.055 *** (0.010)	0.068 *** (0.009)	0.068 *** (0.010)
Log (Local Wheat Price/Kilo)				-1.298 *** (0.155)	-0.877 *** (0.138)	-1.271 *** (0.141)	-0.285 (0.147)	-0.295 * (0.147)
Log (Tomatoes Price/Kilo)				0.484 *** (0.067)	0.376 *** (0.060)	-0.619 *** (0.073)	0.150 (0.279)	0.152 (0.280)
Log (Beef Price/Kilo)				0.237 * (0.108)	-0.091 (0.097)	-1.939 *** (0.130)	-2.293 *** (0.119)	-2.861 *** (0.140)
Log (Potatoes Price/Kilo)				1.263 *** (0.182)	0.641 *** (0.163)	4.380 *** (0.330)	5.653 *** (0.392)	6.142 *** (0.396)
Household Size					-0.101 *** (0.002)	-0.099 *** (0.002)	-0.102 *** (0.002)	-0.101 *** (0.002)
Agriculture					0.238 *** (0.016)	0.218 *** (0.015)	0.223 *** (0.015)	0.222 *** (0.015)
Industry					0.161 *** (0.018)	0.115 *** (0.018)	0.149 *** (0.017)	0.127 *** (0.017)
Services					0.235 *** (0.012)	0.203 *** (0.012)	0.217 *** (0.011)	0.203 *** (0.011)
Migrant: Yes					-0.012 (0.016)	0.002 (0.016)	-0.018 (0.015)	-0.015 (0.015)
Constant	3.513 *** (0.024)	3.359 *** (0.024)	3.675 *** (0.039)	1.693 ** (0.646)	3.963 *** (0.580)	8.274 *** (0.748)	3.780 *** (0.893)	5.315 *** (0.913)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	9876	9876	9876	9876	9876	9876	9876	9876
R2	0.053	0.126	0.139	0.152	0.332	0.370	0.414	0.418

Table 4.3. Probit drought estimates - Agriculture Stress Index (ASI) long-run model

Dep Var: Poverty Headcount	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ASI drought frequency 1984–22	0.022 *** (0.001)	0.022 *** (0.001)	0.021 *** (0.001)	0.026 *** (0.001)	0.024 *** (0.001)	0.025 *** (0.002)	0.029 *** (0.002)	0.032 *** (0.002)
Urban: Yes		-0.189 *** (0.008)	-0.147 *** (0.009)	-0.137 *** (0.010)	-0.090 *** (0.010)	-0.079 *** (0.009)	-0.056 *** (0.009)	-0.049 *** (0.009)
Log (Dist to Wheat Mkt)			0.022 *** (0.005)	0.076 *** (0.007)	0.054 *** (0.006)	0.061 *** (0.010)	0.067 *** (0.009)	0.034 *** (0.010)
Log (Dist to Road)			0.077 *** (0.007)	0.057 *** (0.007)	0.027 *** (0.007)	-0.035 *** (0.008)	-0.046 *** (0.008)	-0.047 *** (0.008)
Log (Local Wheat Price/Kilo)				0.954 *** (0.118)	0.744 *** (0.113)	1.044 *** (0.115)	0.512 *** (0.123)	0.523 *** (0.123)
Log (Tomatoes Price/Kilo)				-0.297 *** (0.052)	-0.240 *** (0.049)	0.554 *** (0.059)	-0.288 (0.233)	-0.291 (0.233)
Log (Beef Price/Kilo)				-0.128 (0.083)	0.072 (0.079)	1.830 *** (0.106)	1.748 *** (0.099)	2.335 *** (0.116)
Log (Potatoes Price/Kilo)				-0.962 *** (0.139)	-0.603 *** (0.134)	-4.799 *** (0.269)	-4.650 *** (0.327)	-5.154 *** (0.330)

Dep Var: Poverty Headcount	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Household Size					0.050 *** (0.002)	0.048 *** (0.002)	0.049 *** (0.002)	0.049 *** (0.002)
Agriculture					-0.153 *** (0.013)	-0.140 *** (0.013)	-0.143 *** (0.012)	-0.142 *** (0.012)
Industry					-0.110 *** (0.015)	-0.071 *** (0.014)	-0.102 *** (0.014)	-0.079 *** (0.014)
Services					-0.144 *** (0.010)	-0.117 *** (0.010)	-0.132 *** (0.009)	-0.118 *** (0.009)
Migrant: Yes					0.032 * (0.013)	0.018 (0.013)	0.029 * (0.013)	0.025 * (0.013)
Constant	0.007 (0.018)	0.100 *** (0.018)	-0.101 *** (0.030)	1.073 * (0.493)	-0.282 (0.474)	-2.695 *** (0.609)	0.417 (0.745)	-1.167 (0.759)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	9876	9876	9876	9876	9876	9876	9876	9876

Table 4.4. OLS drought estimates - Agriculture Stress Index (ASI) short-term model

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2022 ASI > 10%: Yes (Drought)	-0.135 *** (0.012)	-0.185 *** (0.011)	-0.263 *** (0.013)	-0.273 *** (0.014)	-0.281 *** (0.012)	-0.256 *** (0.014)	-0.235 *** (0.014)	-0.248 *** (0.015)
Urban: Yes		0.343 *** (0.011)	0.252 *** (0.012)	0.233 *** (0.013)	0.135 *** (0.012)	0.110 *** (0.012)	0.078 *** (0.011)	0.070 *** (0.012)
Log (Dist to Wheat Mkt)			-0.087 *** (0.007)	-0.109 *** (0.009)	-0.073 *** (0.008)	-0.044 *** (0.011)	-0.059 *** (0.011)	-0.029 * (0.013)
Log (Dist to Road)			-0.128 *** (0.009)	-0.125 *** (0.009)	-0.063 *** (0.008)	0.001 (0.009)	0.011 (0.009)	0.015 (0.009)
Log (Local Wheat Price/Kilo)				0.101 (0.154)	0.479 *** (0.137)	-0.223 (0.149)	-0.029 (0.151)	0.016 (0.153)
Log (Tomatoes Price/Kilo)				0.034 (0.071)	-0.090 (0.063)	-1.016 *** (0.073)	-0.382 (0.283)	-0.334 (0.283)
Log (Beef Price/Kilo)				1.075 *** (0.103)	0.688 *** (0.093)	-1.404 *** (0.128)	-1.392 *** (0.115)	-1.597 *** (0.134)
Log (Potatoes Price/Kilo)				0.331 (0.173)	-0.178 (0.154)	3.175 *** (0.305)	4.991 *** (0.387)	5.083 *** (0.389)
Household Size					-0.104 *** (0.002)	-0.100 *** (0.002)	-0.102 *** (0.002)	-0.100 *** (0.002)
Agriculture					0.234 *** (0.016)	0.214 *** (0.015)	0.221 *** (0.015)	0.219 *** (0.015)
Industry					0.167 *** (0.018)	0.109 *** (0.018)	0.137 *** (0.017)	0.125 *** (0.017)
Services					0.238 *** (0.012)	0.198 *** (0.012)	0.212 *** (0.011)	0.205 *** (0.011)
Migrant: Yes					-0.014 (0.016)	0.002 (0.016)		-0.004 (0.015)
Constant	3.125 *** (0.013)	2.990 *** (0.013)	3.564 *** (0.036)	-1.766 ** (0.637)	0.736 (0.571)	7.103 *** (0.759)	1.793 * (0.914)	2.278 * (0.945)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	9876	9876	9876	9876	9876	9876	9876	
R2	0.022	0.108	0.136	0.146	0.334	0.372	0.409	0.410

The coefficient of 2022 ASI > 10 percent: Yes (Drought) in Table 4.4 is -0.248, significant at 1 percent. Hence, experiencing drought in 2022 is correlated with a decline in consumption of 24.8 percent. The results show that the effects of drought manifest in the long term, but also the short term. Controls have expected signs, and the OLS results are robust to the Probit estimates (not shown).

4.1.2 Flood Main Estimates

Tajikistan’s climate narrative cannot be complete without discussing how floods may potentially affect welfare as well. The coefficient for Flood Frequency 1981–2022 in Table 4.5 is -0.054, significant at 1 percent. Hence, long-term exposure to flood events (or rather rainfall yearly z-scores > +) is negatively associated with household per capita consumption. The estimates show that an additional year of flooding is correlated with a consumption decline of 5.4 percent. Marginally, this effect/correlation is higher than that of the repeated occurrence of drought, which may explain why flooding features more prominently within Tajikistan’s climate discourse. Other explanatory variables have the expected signs and the estimates are overall robust to poverty headcount results obtained via the Probit non-linear estimator (Table 4.6).

Table 4.5. OLS flood estimates - CHIRPS rainfall long-run model

Dep: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Flood Frequency 1981–22	-0.059 *** (0.002)	-0.052 *** (0.002)	-0.052 *** (0.002)	-0.061 *** (0.002)	-0.059 *** (0.002)	-0.053 *** (0.002)	-0.054 *** (0.002)	-0.054 *** (0.002)
Urban: Yes		0.289 *** (0.010)	0.226 *** (0.011)	0.210 *** (0.011)	0.107 *** (0.010)	0.097 *** (0.010)	0.064 *** (0.010)	0.076 *** (0.010)
Log (Dist to Wheat Mkt)			-0.020 *** (0.005)	-0.066 *** (0.007)	-0.036 *** (0.006)	-0.075 *** (0.008)	-0.032 *** (0.008)	-0.052 *** (0.009)
Log (Dist to Road)			-0.137 *** (0.008)	-0.119 *** (0.008)	-0.076 *** (0.007)	-0.052 *** (0.007)	-0.014 (0.008)	-0.027 *** (0.008)
Log (Local Wheat Price/)				-1.374 *** (0.141)	-1.039 *** (0.125)	-1.570 *** (0.134)	-0.924 *** (0.141)	-0.945 *** (0.141)
Log (Tomatoes Price/Kilo)				-0.274 *** (0.057)	-0.445 *** (0.050)	-1.108 *** (0.057)	-1.087 *** (0.223)	-1.270 *** (0.223)
Log (Beef Price/Kilo)				0.952 *** (0.096)	0.586 *** (0.085)	-0.976 *** (0.112)	-1.559 *** (0.109)	-1.839 *** (0.125)
Log (Potatoes Price/Kilo)				1.937 *** (0.146)	1.404 *** (0.130)	1.848 *** (0.165)	4.624 *** (0.359)	5.155 *** (0.363)
Household Size					-0.103 *** (0.002)	-0.100 *** (0.002)	-0.101 *** (0.002)	-0.102 *** (0.002)
Agriculture					0.220 *** (0.014)	0.204 *** (0.014)	0.201 *** (0.014)	0.206 *** (0.014)
Industry					0.153 *** (0.016)	0.124 *** (0.015)	0.137 *** (0.015)	0.136 *** (0.015)
Services					0.221 *** (0.010)	0.195 *** (0.010)	0.199 *** (0.010)	0.197 *** (0.010)
Migrant: Yes					-0.034 * (0.015)	-0.017 (0.014)	-0.027 (0.014)	-0.023 (0.014)
Constant	3.482 *** (0.016)	3.298 *** (0.017)	3.620 *** (0.029)	-0.620 (0.548)	2.065 *** (0.488)	10.566 *** (0.637)	6.729 *** (0.775)	7.472 *** (0.798)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	11631	11631	11631	11631	11631	11631	11631	11631
R2	0.098	0.157	0.182	0.199	0.379	0.414	0.435	0.439

Table 4.6. Probit flood estimates - CHIRPS rainfall long-run model

Dep Var: Poverty Headcount	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Flood Frequency 1981–22	0.035 *** (0.001)	0.031 *** (0.001)	0.031 *** (0.001)	0.032 *** (0.002)	0.030 *** (0.002)	0.026 *** (0.002)	0.031 *** (0.002)	0.032 *** (0.002)
Urban: Yes		-0.179 *** (0.008)	-0.141 *** (0.008)	-0.137 *** (0.008)	-0.081 *** (0.008)	-0.069 *** (0.008)	-0.054 *** (0.008)	-0.056 *** (0.008)
Log (Dist to Wheat Mkt)			0.002 (0.004)	0.026 *** (0.005)	0.011 * (0.005)	0.019 ** (0.007)	0.016 * (0.006)	0.016 * (0.007)
Log (Dist to Road)			0.098 *** (0.006)	0.083 *** (0.006)	0.059 *** (0.006)	0.037 *** (0.006)	0.006 (0.006)	0.013 (0.006)
Log (Local Wheat Price)				0.885 *** (0.109)	0.722 *** (0.104)	1.218 *** (0.112)	0.823 *** (0.118)	0.882 *** (0.118)
Log (Tomatoes Price/Kilo)				0.108 * (0.044)	0.197 *** (0.041)	0.646 *** (0.048)	0.341 (0.186)	0.453 * (0.186)
Log (Beef Price/Kilo)				-0.584 *** (0.074)	-0.357 *** (0.071)	0.942 *** (0.094)	1.332 *** (0.091)	1.719 *** (0.104)
Log (Potatoes Price/Kilo)				-0.846 *** (0.113)	-0.536 *** (0.108)	-1.026 *** (0.138)	-3.615 *** (0.299)	-4.079 *** (0.303)
Household Size					0.051 *** (0.002)	0.049 *** (0.002)	0.049 *** (0.002)	0.049 *** (0.002)
Agriculture					-0.142 *** (0.012)	-0.131 *** (0.012)	-0.128 *** (0.011)	-0.129 *** (0.011)
Industry					-0.120 *** (0.013)	-0.097 *** (0.013)	-0.104 *** (0.013)	-0.095 *** (0.013)
Services					-0.144 *** (0.009)	-0.124 *** (0.009)	-0.128 *** (0.008)	-0.121 *** (0.008)
Migrant: Yes					0.043 *** (0.012)	0.031 * (0.012)	0.034 ** (0.012)	0.030 * (0.012)
Constant	0.052 *** (0.012)	0.166 *** (0.013)	-0.017 (0.022)	2.090 *** (0.423)	0.487 (0.405)	-6.176 *** (0.532)	-1.654 * (0.647)	-2.850 *** (0.666)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	11631	11631	11631	11631	11631		11631	11631

4.2 Difference-in-Differences Estimates

This section presents results from the difference-in-differences (DID) estimation for the causal effects of experiencing drought in 2022 on 2023 per capita consumption, conditional of 2021 drought incidence = 1. We use the OLS estimator, with the endogenous variable being log per capita consumption. The results are shown in Table 4.7.

Similar to the correlational analysis (Tables 4.2 – 4.6) controls are added progressively from Columns (1)–(8). Drought 2022 (Treat) x Post is the causal effect and coefficient of interest (Equation 3). It is negative and statistically significant across Columns (1)–(5). In Column (5), is -0.083, significant at 1 percent. Hence the per capita consumption of households affected by drought in 2022, conditional on experiencing drought in 2021 fell by 8.3 percent.

4.3 Heterogeneity and Interaction Effects

4.3.1 Interaction Effects - Distance to Market and Altitude

Tables 4.2 to 4.7 show average estimates, yet the effects of drought and flooding may differ depending on where an observation is located on the distributional. Access to markets and

remoteness have an influence on exacerbating or mitigating the effects of climate shocks on consumption or poverty headcount. Out of our explanatory variables, distance to market and altitude are two important variables whose confounding effect on per capita consumption may depend on position on the distribution. We use interaction effects to examine the change in the slope of our effects. To reduce complexity, we introduce altitude and distance to our specifications separately. In Table 4.8, we present short-term effects of drought (experiencing FAO ASI ≥ 10 percent in 2022), interacted with log distance to market, log distance to road and log altitude. On the other hand, Table 4.9 presents heterogeneity estimates where a dummy of long-term exposure to drought is interacted with distances and altitude. The dummy of long-term exposure to drought takes values of 1 if long term FAO ASI ≥ 10 percent frequency exceeds the median and zero otherwise. Note that Probit estimates (based on poverty headcount) produce results that mirror those in Tables 4.8 to 4.9.

Table 4.7. Causal effect of experiencing drought on per capita consumption

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat	0.043 ** (0.014)	-0.021 (0.014)	-0.032 * (0.015)	-0.036 * (0.015)	-0.084 *** (0.015)	-0.062 *** (0.015)	-0.064 *** (0.015)	-0.112 *** (0.016)
Post	0.307 *** (0.015)	0.298 *** (0.014)	0.292 *** (0.014)	0.141 *** (0.040)	0.174 *** (0.038)	0.698 *** (0.047)	0.269 *** (0.053)	0.218 *** (0.053)
Drought 2022 (Treat) X Post	-0.122 *** (0.019)	-0.109 *** (0.018)	-0.111 *** (0.018)	-0.116 *** (0.018)	-0.083 *** (0.017)	0.001 (0.018)	-0.002 (0.018)	-0.006 (0.018)
Urban: Yes		0.251 *** (0.009)	0.191 *** (0.010)	0.181 *** (0.011)	0.128 *** (0.010)	0.061 *** (0.010)	0.072 *** (0.010)	0.044 *** (0.011)
Log (Dist to Wheat Mkt)			-0.022 *** (0.005)	-0.032 *** (0.006)	-0.017 ** (0.005)	-0.012 (0.008)	-0.019 * (0.008)	-0.001 (0.009)
Log (Dist to Road)			-0.086 *** (0.007)	-0.085 *** (0.007)	-0.058 *** (0.007)	-0.009 (0.007)	-0.022 ** (0.007)	-0.003 (0.007)
Log (Local Wheat Price)				0.184 (0.146)	0.440 ** (0.139)	-0.087 (0.155)	0.189 (0.155)	0.353 * (0.155)
Log (Beef Price/Kilo)				1.033 *** (0.100)	0.968 *** (0.094)	-0.147 (0.108)	-0.775 *** (0.106)	-0.583 *** (0.116)
Log (Potatoes Price/Kilo)				0.229 (0.136)	0.008 (0.129)	-1.947 *** (0.187)	-0.034 (0.216)	0.123 (0.216)
Household Size					-0.074 *** (0.002)	-0.067 *** (0.002)	-0.071 *** (0.002)	-0.069 *** (0.002)
Agriculture					0.086 *** (0.022)	0.019 (0.021)	0.024 (0.021)	0.016 (0.021)
Industry					0.040 ** (0.012)	0.039 ** (0.012)	0.023 (0.012)	0.024 * (0.012)
Services					0.044 *** (0.010)	0.059 *** (0.010)	0.058 *** (0.010)	0.060 *** (0.009)
Migrant: Yes					-0.013 (0.014)	-0.004 (0.013)	-0.003 (0.013)	-0.005 (0.013)
Constant	2.789 *** (0.014)	2.716 *** (0.014)	2.964 *** (0.030)	-1.949 *** (0.579)	-1.437 ** (0.549)	7.251 *** (0.681)	6.358 *** (0.668)	5.065 *** (0.703)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	15427	15427	15427	15427	15427	15427	15427	15427
R2	0.056	0.103	0.112	0.118	0.211	0.261	0.291	0.296

2021 Tomato prices are missing, hence exclusion of tomato prices in specification

Table 4.8. Effect of experiencing drought in 2022 on consumption - interaction effects

Dep Var: Log per capita consumption	Interactions					
	Dist to Mkt (1)	Dist to Road (2)	Altitude (3)	Dist to Mkt (4)	Dist to Road (5)	Altitude (6)
2022 ASI > 10%: Yes (Drought)	0.587 *** (0.051)	0.190 *** (0.031)	-0.541 *** (0.089)	-1.173 *** (0.072)	-0.389 *** (0.039)	-0.322 *** (0.078)
Log (Dist to Wheat Mkt)	0.005 (0.010)			-0.192 *** (0.016)		
Log (Dist to Road)		-0.092 *** (0.013)			-0.021 (0.013)	
Log (Altitude + 1)			-0.036 *** (0.008)			-0.012 (0.007)
Drought x Dist to Mkt	-0.236 *** (0.014)			0.306 *** (0.022)		
Drought x Dist to Road		-0.171 *** (0.018)			0.100 *** (0.019)	
Drought x Altitude			0.079 *** (0.014)			0.028 * (0.012)
Constant	3.144 *** (0.042)	3.307 *** (0.022)	3.446 *** (0.053)	6.774 *** (1.031)	4.000 *** (0.967)	3.412 ** (1.294)
Controls	No	No	No	Yes	Yes	Yes
N	8905	8905	6254	8905	8905	6254
R2	0.061	0.055	0.007	0.399	0.387	0.365

In Dist to Mkt Column (1), 2022 ASI > 10 percent: Yes (Drought) has a coefficient of 0.587 that is significant at 1 percent. This means that households affected by 2021 FAO ASI drought but close to markets (Distance= 0 hypothetically) had 58.7 percent higher consumption than those not affected by drought but also closer to markets elsewhere. In this sense, drought occurrence may be a push factor that forces households to look for more lucrative off-farm work (maybe trading in the market), yet households in that did not experience drought in previous year possibly stick with less-lucrative farming. The Drought x Dist to Mkt coefficient has a coefficient of -0.236, which shows that the advantage of proximity to markets attenuates as distance from markets increase such that households further away from markets have less consumption when affected by drought in previous year, relative to those not affected. In Column (2) Dist to Road, we also observe that the consumption of households affected by 2022 FAO ASI drought but in close proximity to roads is 20 percent higher on average than those not affected by the drought but also close to roads in their localities. This consumption premium dissipates as distance from road increases in similar fashion to distance to market. However, once we add controls to the specifications in Columns (4) and (5), these effects disappear. In terms of Altitude, Column (3) - 2022 ASI > 10 percent: Yes (Drought) has a coefficient of -0.541 (significant at 1 percent). This seems to suggest that at sea level, the consumption of households affected by drought in 2022 is lower than those not affected by drought but also located at sea level elsewhere by 54 percent, while the interaction term (2022 ASI > 10 percent: Yes (Drought)) coefficient of 0.306 (significant at 1 percent) shows that as altitude rises, those affected by drought become better off (higher per capita consumption than those not affected). This effect is robust to controls in Column (6).

Table 4.9. Effect of long-term exposure to drought on consumption - interaction effects

Dep Var: Log per capita consumption	Interactions					
	Dist to Mkt (1)	Dist to Road (2)	Altitude (3)	Dist to Mkt (4)	Dist to Road (5)	Altitude (6)
ASI > 10% LT Exp: Yes	0.598 *** (0.046)	-0.019 (0.031)	-0.906 *** (0.085)	0.292 *** (0.045)	-0.375 *** (0.035)	-0.396 *** (0.073)
Log (Dist to Wheat Mkt)	0.061 *** (0.010)			0.052 ** (0.017)		
Log (Dist to Road)		-0.167 *** (0.014)			-0.030 (0.016)	
Log (Altitude + 1)			-0.074 *** (0.009)			-0.016 (0.008)
Drought x Dist to Mkt	-0.203 *** (0.013)			-0.134 *** (0.013)		
Drought x Dist to Road		-0.019 (0.019)			0.124 *** (0.021)	
Drought x Altitude			0.136 *** (0.013)			0.036 ** (0.011)
Constant	2.937 *** (0.039)	3.411 *** (0.023)	3.697 *** (0.059)	6.718 *** (0.961)	9.376 *** (1.000)	8.565 *** (1.261)
Controls	No	No	No	Yes	Yes	Yes
N	8905	8905	6254	8905	8905	6254
R2	0.043	0.043	0.019	0.394	0.388	0.370

We also implement the interactions regression for the long-term case; we create a dummy of long-term exposure to drought that takes values of 1 if FAO ASI drought frequency exceeds the long-term median and 0 if otherwise. The interaction effects of this dummy on distance and altitude are presented in Table 4.9. The results largely mirror those in Table 4.8, with the interaction between long-term exposure to drought and distance to markets being robust to controls in Column 4, confirming the mitigating roles played by access/proximity to markets in altering labor supply decisions and diversification into off-farm activities for households that face repeated occurrence of drought.

4.3.2 Heterogeneity by Geography and Quintile

The effects of climate shocks may change covariately based on climatic zones, regions or across different consumption strata. Against this background, we show the main results (FAO ASI Results) by consumption quintile (Table 4.10) and region (Tables 4.11 and 4.12), respectively. In Table 4.10, we show per capita consumption-drought regressions based on the 25th, 50th and 75th percentiles, respectively. Columns (a)–(c) show baseline estimates while full controls are presented in (d)–(f). The results for the full specification appear stronger than the baseline estimates, and controls largely align with OLS findings. In Table 4.10, it is evident that the effects of experiencing a drought in the previous year (short term) and frequent exposure to drought (long term) negatively affect consumption, albeit to varying degrees depending on the location of the household on the consumption distribution.

Table 4.10. Effects of drought on consumption (FAO ASI) - quantile regression

Dep Var: Log per capita consumption	Baseline			Full Controls		
	Q 25	Q 50	Q75	Q25	Q50	Q75
2022 ASI > 10%: Yes (Drought)	-0.025 (0.0217)	-0.022 (0.0183)	-0.060 (0.024)**	-0.071 (0.022)***	-0.046 (0.016)***	-0.073 (0.023)***
ASI drought Frequency 1984–22	-0.033 (0.0032)***	-0.035 (0.002)***	-0.031 (0.003)***	-0.02 (0.003)***	-0.023 (0.003)***	-0.021 (0.003)***
Constant	3.243 (0.0404)***	3.624 (0.0290)***	3.96 (0.033)***	-1.2 (1.074)	0.76 (1.256)	2.64 (1.119)**
Full Controls	No	No	No	Yes	Yes	Yes
Pseudo-R Squared	0.0258	0.0293	0.0205	0.0766	0.0849	0.0841

Based on STATA sqreg. see Baum (2016) and others.

Table 4.11. Regionally disaggregated short-term effects of drought on consumption (FAO ASI)

Dep Var: Log per capita	Baseline				Full controls			
	DRS	GB	Khatlon	Sughd	DRS	GB	Khatlon	Sughd
2022 ASI > 10%: Yes (Drought)	-0.132*** (0.027)	-0.470 (0.336)	-0.184*** (0.020)	-0.235*** (0.055)	-0.256*** (0.040)	-0.081 (0.413)	-0.222*** (0.022)	-0.074 (0.228)
Constant	3.035*** (0.031)	3.160*** (0.060)	2.911*** (0.023)	3.187*** (0.023)	-2.352** (0.899)	0.592 (3.275)	3.894*** (0.176)	0.067 (11.522)
N	1569	242	3331	2259	1569	242	3331	2259
R2	0.018	0.128	0.041	0.016	0.369	0.412	0.253	0.306

Table 4.12. Regionally disaggregated long-term effects of drought on consumption (FAO ASI)

	Baseline				Full controls			
	Dushanbe	GB	Khatlon	Sughd	Dushanbe	GB	Khatlon	Sughd
ASI drought frequency 1984–22	0.054*** (0.009)	0.094 (0.067)	-0.012*** (0.002)	-0.040*** (0.004)	-1.140 (1.990)	0.016 (0.083)	-0.019*** (0.003)	-0.029*** (0.005)
Constant	2.703*** (0.126)	1.655 (1.067)	2.985*** (0.044)	3.631*** (0.048)	32.840 (50.012)	0.333 (2.692)	3.774*** (0.091)	5.462*** (0.114)
N	1504	242	3331	2259	1504	242	3331	2259
R2	0.051	0.128	0.023	0.056	0.228	0.412	0.200	0.292

5. Conclusions and Policy Recommendations

The effects of climate-related shocks on household outcomes are complex. For Tajikistan, we show that household per capita consumption is affected by both short-term and long-term climate dynamics. Using FAO ASI, the results show a negative association between repeated exposure to drought (long-term frequency) and per capita consumption. A similar result is observed on experiencing drought in the previous year and per capita consumption for both FAO ASI and SSM. While these short- and long-term dynamics are essential, they nevertheless are not an assessment of causal effects. The study therefore takes advantage of availability of HBS data for 2021 and 2022, as well as exogenous geographical distribution of drought (FAO ASI) in 2021 (the intervening year) to investigate causal effects of drought on household consumption in a difference-in-differences identification framework. The analysis shows a decline in consumption of 8 percent if a household experienced drought in 2022, conditional on having experienced it in 2021 as well. This result is significant, and reveals household vulnerability to repeated occurrence of drought.

The study shows that drought, flooding and other climate-related shocks (heat stress and extreme cold) pose significant risks to consumption Tajikistan, and there is significant geographical and other forms of heterogeneity in terms magnitude of estimates and direction of coefficients for different regions, for example. The study also reveals these heterogeneities by quintile, providing clear, nuanced information that may inform targeting on the part of policy makers. Beyond that, the study shows that distance to market and altitude play an important role in mitigating the effects of drought. Therefore, promoting better access to markets through infrastructure improvements or provisioning (roads, for example) may reduce friction in market access. The results are indicative of the important role played by non-farm incomes, with households in areas affected by drought in the long term having better welfare outcomes than those not affected, as long as they were close to markets. A potential explanation is that proximity to markets allows households to diversify into non-farm activities that whose returns are higher than farming. Therefore, as a push factor, long-term exposure to drought may spur households to supply their skills and time in more productive markets. Hence, beyond investments in infrastructure, empowering households with employable or income generating skills may enable a higher share of households in drought prone areas to earn income outside agriculture. Apart from that adopting Conservation Agriculture (CA) practices, proliferation of irrigation, as well as drought resistant crop varieties may help mitigate the effects of drought.

The study shows extreme cold and heat stress to be negatively correlate with consumption. The poor spend a higher share of their income on energy (Olabisi & Richardson 2022) and extreme cold weather events disproportionately increase the energy cost burden for poorer households, reducing disposable incomes and consumption (Li et al. 2023), while heat stress negatively affects labor productivity and wellbeing (Habibi et al. 2024) for farmers and other outdoor workers. These results may have impacts for energy and labor policies.

Annex 1.

Additional Estimates

Table A1.3. OLS SSM drought estimates – short-term model

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2022 SSM Drought: Yes	-0.679 *** (0.070)	-0.611 *** (0.067)	-0.630 *** (0.067)	-0.361 *** (0.068)	-0.262 *** (0.061)	-0.351 *** (0.059)	-0.367 *** (0.059)	-0.366 *** (0.058)
Urban: Yes		0.333 *** (0.010)	0.275 *** (0.011)	0.266 *** (0.011)	0.159 *** (0.010)	0.138 *** (0.010)	0.083 *** (0.010)	0.095 *** (0.010)
Log (Dist to Wheat Mkt)			-0.012 * (0.005)	-0.050 *** (0.007)	-0.021 *** (0.006)	-0.061 *** (0.008)	-0.027 *** (0.008)	-0.048 *** (0.009)
Log (Dist to Road)			-0.139 *** (0.008)	-0.113 *** (0.008)	-0.069 *** (0.007)	-0.048 *** (0.007)	-0.022 ** (0.008)	-0.034 *** (0.008)
Log (Local Wheat Price)				-0.852 *** (0.145)	-0.544 *** (0.129)	-1.340 *** (0.138)	-0.760 *** (0.144)	-0.785 *** (0.144)
Log (Tomatoes Price/Kilo)				0.422 *** (0.053)	0.224 *** (0.047)	-0.686 *** (0.057)	-0.421 (0.226)	-0.609 ** (0.227)
Log (Beef Price/Kilo)				1.120 *** (0.099)	0.729 *** (0.089)	-1.048 *** (0.116)	-1.460 *** (0.112)	-1.707 *** (0.127)
Log (Potatoes Price/Kilo)				-0.209 (0.129)	-0.695 *** (0.115)	-0.264 (0.152)	2.961 *** (0.360)	3.478 *** (0.365)
Household Size					-0.103 *** (0.002)	-0.099 *** (0.002)	-0.100 *** (0.002)	-0.102 *** (0.002)
Agriculture					0.239 *** (0.015)	0.216 *** (0.014)	0.211 *** (0.014)	0.215 *** (0.014)
Industry					0.191 *** (0.016)	0.143 *** (0.016)	0.151 *** (0.016)	0.151 *** (0.016)
Services					0.239 *** (0.011)	0.200 *** (0.011)	0.199 *** (0.010)	0.196 *** (0.010)
Migrant: Yes					-0.038 * (0.015)	-0.019 (0.015)		-0.029 * (0.014)
Constant	3.078 *** (0.011)	2.924 *** (0.011)	3.218 *** (0.027)	-0.630 (0.566)	2.200 *** (0.508)	12.815 *** (0.654)	6.992 *** (0.793)	7.634 *** (0.816)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	11631	11631	11631	11631	11631	11631	11631	11631
R2	0.014	0.096	0.119	0.145	0.328	0.375	0.409	0.413

Table A1.2. OLS heat stress estimates – short-term model

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2022 Temp > 98 th %: Yes (Heat)	-0.277 *** (0.016)	-0.243 *** (0.015)	-0.302 *** (0.015)	-0.459 *** (0.021)	-0.459 *** (0.019)	-0.329 *** (0.019)	-0.463 *** (0.023)	-0.455 *** (0.023)
Urban: Yes		0.324 *** (0.010)	0.246 *** (0.011)	0.260 *** (0.011)	0.154 *** (0.010)	0.138 *** (0.010)	0.073 *** (0.010)	0.081 *** (0.010)
Log (Dist to Wheat Mkt)			-0.024 *** (0.005)	-0.059 *** (0.007)	-0.029 *** (0.006)	-0.051 *** (0.008)	-0.015 (0.008)	-0.027 ** (0.009)

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (Dist to Road)			-0.164 *** (0.008)	-0.138 *** (0.008)	-0.095 *** (0.007)	-0.068 *** (0.007)	-0.039 *** (0.008)	-0.048 *** (0.008)
Log (Local Wheat Price/Kilo)				-2.845 *** (0.168)	-2.527 *** (0.149)	-2.674 *** (0.158)	-2.371 *** (0.163)	-2.389 *** (0.164)
Log (Tomatoes Price/Kilo)				-0.046 (0.056)	-0.244 *** (0.050)	-0.806 *** (0.057)	-1.138 *** (0.226)	-1.284 *** (0.226)
Log (Beef Price/Kilo)				-0.363 ** (0.119)	-0.746 *** (0.105)	-1.869 *** (0.125)	-2.926 *** (0.132)	-3.214 *** (0.147)
Log (Potatoes Price/Kilo)				0.357 ** (0.129)	-0.106 (0.114)	0.288 (0.153)	3.605 *** (0.356)	4.094 *** (0.361)
Household Size					-0.104 *** (0.002)	-0.101 *** (0.002)	-0.102 *** (0.002)	-0.103 *** (0.002)
Agriculture					0.231 *** (0.015)	0.218 *** (0.014)	0.218 *** (0.014)	0.220 *** (0.014)
Industry					0.168 *** (0.016)	0.140 *** (0.016)	0.145 *** (0.015)	0.141 *** (0.015)
Services					0.225 *** (0.011)	0.202 *** (0.010)	0.198 *** (0.010)	0.193 *** (0.010)
Migrant: Yes					-0.043 ** (0.015)	-0.024 (0.015)		-0.026 (0.014)
Constant	3.108 *** (0.011)	2.954 *** (0.012)	3.349 *** (0.027)	9.462 *** (0.719)	12.208 *** (0.638)	18.001 *** (0.719)	16.760 *** (0.922)	17.505 *** (0.952)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	11631	11631	11631	11631	11631	11631	11631	11631
R2	0.032	0.109	0.142	0.177	0.361	0.389	0.427	0.430

Table A1.3. OLS heat stress estimates – long-term model

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Heat Stress Freq (1980–22)	-0.022 *** (0.001)	-0.018 *** (0.001)	-0.023 *** (0.001)	-0.023 *** (0.002)	-0.023 *** (0.002)	-0.034 *** (0.002)	-0.047 *** (0.002)	-0.048 *** (0.002)
Urban: Yes		0.325 *** (0.010)	0.246 *** (0.011)	0.258 *** (0.011)	0.152 *** (0.010)	0.127 *** (0.010)	0.067 *** (0.010)	0.077 *** (0.010)
Log (Dist to Wheat Mkt)			-0.033 *** (0.005)	-0.041 *** (0.007)	-0.012 (0.006)	-0.051 *** (0.008)	-0.015 * (0.008)	-0.033 *** (0.009)
Log (Dist to Road)			-0.152 *** (0.008)	-0.129 *** (0.008)	-0.086 *** (0.007)	-0.062 *** (0.007)	-0.019 * (0.008)	-0.031 *** (0.008)
Log (Local Wheat Price/Kilo)				-1.096 *** (0.145)	-0.775 *** (0.130)	-1.582 *** (0.137)	-0.969 *** (0.142)	-1.014 *** (0.142)
Log (Tomatoes Price/Kilo)				0.212 *** (0.056)	0.017 (0.050)	-0.985 *** (0.059)	-1.025 *** (0.225)	-1.233 *** (0.225)
Log (Beef Price/Kilo)				-0.072 (0.149)	-0.441 *** (0.132)	-3.048 *** (0.162)	-4.538 *** (0.183)	-4.914 *** (0.196)
Log (Potatoes Price/Kilo)				-0.702 *** (0.133)	-1.158 *** (0.119)	-0.393 ** (0.150)	3.710 *** (0.356)	4.307 *** (0.360)
Household Size					-0.103 *** (0.002)	-0.100 *** (0.002)	-0.101 *** (0.002)	-0.102 *** (0.002)
Agriculture					0.238 *** (0.015)	0.213 *** (0.014)	0.209 *** (0.014)	0.212 *** (0.014)

Dep Var: Log per capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industry					0.181*** (0.016)	0.133*** (0.016)	0.137*** (0.015)	0.134*** (0.015)
Services					0.232*** (0.011)	0.192*** (0.010)	0.188*** (0.010)	0.183*** (0.010)
Migrant: Yes					-0.045** (0.015)	-0.028 (0.014)		-0.034* (0.014)
Constant	3.095*** (0.011)	2.942*** (0.012)	3.344*** (0.028)	6.310*** (0.844)	8.964*** (0.751)	22.750*** (0.863)	20.607*** (1.016)	21.740*** (1.042)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	11631	11631	11631	11631	11631	11631	11631	11631
R2	0.025	0.102	0.132	0.152	0.335	0.390	0.429	0.434

Table A1.4. OLS extreme cold estimates – long-term model

Dep Var: Log capita consumption	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Extreme Cold Freq (1980–22)	-0.160*** (0.013)	-0.132*** (0.013)	-0.049*** (0.014)	0.146*** (0.019)	0.069*** (0.017)	-0.035* (0.017)	-0.101*** (0.017)	-0.085*** (0.017)
Urban: Yes		0.329*** (0.010)	0.280*** (0.011)	0.256*** (0.011)	0.154*** (0.010)	0.141*** (0.010)	0.087*** (0.010)	0.098*** (0.010)
Log (Dist to Wheat Mkt)			-0.011* (0.006)	-0.054*** (0.007)	-0.023*** (0.006)	-0.064*** (0.008)	-0.032*** (0.008)	-0.052*** (0.009)
Log (Dist to Road)			-0.125*** (0.009)	-0.136*** (0.009)	-0.079*** (0.008)	-0.037*** (0.008)	0.001 (0.008)	-0.014 (0.009)
Log (Local Wheat Price/Kilo)				-0.910*** (0.145)	-0.583*** (0.129)	-1.338*** (0.138)	-0.798*** (0.144)	-0.815*** (0.144)
Log (Tomatoes Price/Kilo)				0.348*** (0.053)	0.190*** (0.048)	-0.665*** (0.057)	-0.413 (0.227)	-0.592** (0.227)
Log (Beef Price/Kilo)				1.194*** (0.099)	0.769*** (0.089)	-1.049*** (0.116)	-1.527*** (0.112)	-1.742*** (0.128)
Log (Potatoes Price/Kilo)				-0.694*** (0.138)	-0.944*** (0.123)	-0.226 (0.153)	3.143*** (0.361)	3.603*** (0.366)
Household Size					-0.102*** (0.002)	-0.099*** (0.002)	-0.101*** (0.002)	-0.102*** (0.002)
Agriculture					0.237*** (0.015)	0.220*** (0.014)	0.219*** (0.014)	0.222*** (0.014)
Industry					0.190*** (0.016)	0.148*** (0.016)	0.154*** (0.016)	0.155*** (0.016)
Services					0.241*** (0.011)	0.206*** (0.011)	0.203*** (0.010)	0.201*** (0.010)
Migrant: Yes					-0.038* (0.015)	-0.016 (0.015)		-0.024 (0.014)
Constant	3.575*** (0.043)	3.336*** (0.042)	3.341*** (0.043)	-0.150 (0.568)	2.453*** (0.510)	12.782*** (0.658)	7.273*** (0.794)	7.800*** (0.818)
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FEs	No	No	No	No	No	Yes	No	Yes
Livelihood Zone FEs	No	No	No	No	No	No	Yes	Yes
N	11631	11631	11631	11631	11631	11631	11631	11631
R2	0.019	0.098	0.114	0.148	0.328	0.374	0.409	0.413

Annex 2

Table A2.1. Data sources and description

Data Type	Variable	Data and Source	Type, Description and Temporal Frequency
Climate	Extreme Heat & Extreme Cold	Climate Research Unit (CRU) HadCRUT5 temperature data	There is significant variation in temperature with lowlands frequently experiencing heat waves and high-altitude areas recording extreme cold. Therefore, episodes of extreme cold and heat stress in high and low altitude areas respectively may affect welfare. We calculate seasonal z-scores based on temperature data, with values above +1 and those below -1 interpreted as episodes of as extreme heat and extreme cold, respectively.
Climate	Excessive Rainfall/Flood	CHIRPS rainfall data (1981–2023)	We rely on CHIRPS data to identify episodes of excessive rainfall (floods) if: (i) Rainfall exceeds the long term 98th percentile [see Baque & Fuje (2022)], (ii) Standardized rainfall z-score exceeds +1
Climate	Drought	Copernicus Surface Soil Moisture (SSM) (2000/2007–2024)	(iii) Copernicus Soil Surface Moisture data (SSM) at 10% depth (2000–2024) is an off-the-shelf drought dataset that performs well in capturing the effect of drought on welfare (at least for the African case - see Gascogne et al. 2024). Lower soil moisture denotes dry/drought conditions.
Climate	Drought	FAO Agriculture Stress Index (ASI)	(iv) The third off-the-shop drought measure in the FAO Agriculture Stress Index (ASI) (1984–2024) measures the percentage of the area affected by drought (i.e., the percentage of land area wherein VHI < 40). VHI is Vegetation Health Index (VHI). ASI has the advantage that it can accessed only for crop areas, or over grasslands.
Access to Markets/ Infrastructure	Road Access	Global Roads Open Access Data	We calculate distance to nearest road as a measure of market access. The potential drawback with the Global Roads Open Access Data (GROAD) does not provide the quality of the road, for example, whether it is paved.
Access to Markets/ Infrastructure	Markets	WFP Price Data	The World Food Program (WFP) provide high temporal frequency data on monthly prices of various food and other essentials, starting in 2002. The prices vary across 17 markets dotted across the country. We therefore calculate distance to nearest market from the Enumeration Area (EA) or Rayon centroid in kilometers (KMs) as a measure of market access.
Access to Markets/ Infrastructure	Prices	WFP Price Data	WFP provides monthly food and other essentials prices from the year 2002 for Tajikistan and other countries. Based on this, we calculate annual prices for all commodities, fuels, food, non-food items as well as wages; based on prices obtaining on the nearest WFP markets (out of 17 in the WFP database).

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September 2025