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Pakistan@2050: Demographic change, future projections, and development opportunities

Population Council

Pakistan @2050

Demographic Change, Future Projections, and Development Opportunities

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About the Population Council

The Population Council confronts critical health and development issues—from stopping the spread of HIV to improving reproductive health and ensuring that young people lead full and productive lives. Through biomedical, social science and public health research in 50 countries, we work with our partners to deliver solutions that lead to more effective policies, programs, and technologies that improve lives around the world. Established in 1952 and headquartered in New York, the Council is a nongovernmental, nonprofit organization governed by an international board of trustees.

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Foreword

I am pleased to introduce Pakistan@2050, which addresses demographic change, future projections, and consequent challenges and opportunities on Pakistan's development landscape. This intellectual piece is the outcome of a collaboration between UNFPA and the Population Council, aiming to explore solutions for Pakistan's population and development agenda.

According to the 2024 UNFPA State of World Population Report, Pakistan will be one of the eight countries contributing to half of the projected global population growth by 2050. The "population anxieties" felt by politicians and development practitioners in Pakistan, stemming from rapid population growth and its impact on development, are genuine concerns. Addressing this issue requires careful insights and long-term vision to transform the link between population dynamics, poverty, health, education, nutrition, and other socioeconomic dimensions into opportunities.

This transformation can be achieved through the promotion of public policies, programs, and radical reforms. It requires a critical shift in the national population narrative—from focusing on mere population numbers to emphasizing human capital—urging policymakers and stakeholders to abandon oversimplified narratives about population booms and instead concentrate on empowering individuals, especially women, to exercise their right to make their own reproductive choices freely. Access to high-quality health and social services paves the way for a productive economy that aligns with Pakistan's aspirations.

Pakistan@2050 is a unique volume that provides comprehensive evidence and insights into the linkages between population dynamics and development. It illustrates Pakistan's position regarding demographic transition and offers a regional comparison. The study highlights how population trends and dynamics significantly shape development outcomes, emphasizing the need to integrate these factors into both short-term and, most importantly, long-term planning and policy decisions. Long-term planning in Pakistan has faced persistent challenges related to poverty, climate change, and a tendency towards reactive rather than proactive interventions. These approaches often overlook the impact of high population growth on development gains.

It is vital to incorporate demographic trends and realities into our planning for health, education, employment, urbanization, the environment, and all socio-economic sectors. Simultaneously, we must recognize how these demographic realities amplify the threat posed by poverty, as well as weaknesses in the health and education systems.

The report provides insights into the level of support the government must offer to ensure that families receive the necessary services, accurate information, and resources to make safe and effective reproductive decisions. Pakistan must unify its perspective and goals regarding population issues. Solutions should address both the challenges of a growing population and the perception that it may threaten stability and development gains. Attempts to enforce a reduction of birth rates

solely through numerical targets have proven to be misguided, as they can distort population structures, provoke backlash from certain groups, and cause distrust in government intentions.

Instead, the report underscores the importance of investing in human capital and adopting a rights-based approach as more relevant, rewarding, and sustainable. This approach involves improving the quality of education and healthcare—especially sexual and reproductive health and family planning—and creating an enabling environment for informed reproductive choices. This will only be effective if population dynamics are genuinely integrated into planning, with key performance indicators (KPIs) identified for success across all sectors.

A long-term, evidence-based approach to understanding population dynamics can unlock the potential for socio-economic development in Pakistan, benefitting its people through vital planning and forecasting tools. The present analysis, which focuses on demographic planning as outlined in this report, is essential for anticipating the expected demand in key sectors such as health, education, the labor market, and climate change. I invite interested partners to collaborate with us in the coming years to expand this analysis to include additional thematic areas that are critical to Pakistan's future.

The study has been a labor of academic and intellectual passion, which evolved through close collaboration between UNFPA and the Population Council. I am honored to extend my special thanks to the exceptional leadership of Dr. Zeba Sathar and the lead researchers, whose academic expertise has ensured the highest level of methodological rigor and practical applicability. I would also like to express my appreciation to my dedicated team at UNFPA for their invaluable programmatic and oversight support in undertaking this significant study.

I call upon the government, politicians, and all stakeholders to leverage the insights from this report to deepen their understanding of the critical linkages between population and development and the negative consequences of neglecting population factors in development planning and interventions.

UNFPA is committed to providing ongoing technical and financial support to Pakistan across all areas of its mandate, including population and development, sexual and reproductive health, gender equality, and youth development.

Dr. Luay Shabaneh
UNFPA Representative

Acknowledgments

This volume was jointly conceived by UNFPA and the Population Council, Pakistan to assess Pakistan's demographic and economic outlook leading up to 2050. We are grateful to the UNFPA for financially supporting the analysis and its dissemination, which we hope will activate immediate actions required to secure Pakistan's pathway to greater development by 2050. We extend our gratitude to the UNFPA team led by Dr. Luay Shabaneh, Country Representative UNFPA, for their valuable input in the initial planning discussions for this book. We are also honored that Dr. Shabaneh graciously agreed to write the foreword to the book.

We are grateful for the contributions of all the authors who dedicatedly set aside time for the volume despite their prior commitments. They agreed to meet a tight deadline of nine months to finalize the volume, allowing the current Government to fully leverage the analysis and recommendations.

Apart from the contributions of the authors, several persons have been extremely supportive and generous with their time, and we are extremely grateful to them. We express our special thanks to our colleagues from the Ministry of Planning, Development, and Special Initiatives for their valuable inputs during the consultative process for this volume.

We would especially like to thank Dr. G.M. Arif, who kindly did a thorough review of all the chapters along with the Population Council team. He revised the volume's outline and provided authors with valuable feedback for finalizing their respective chapters. We would also like to thank Dr. Ali Mir, Senior Director Programs and Research at Population Council, who reviewed and commented on the various versions of the chapters. Lastly, Christina Yukwan edited the chapters and arranged the layout and final form of the book for publication.

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CHAPTER 1

Overview: Pakistan at 2050

Zeba Sathar
G.M. Arif

Background for the Study

The results of the 2023 Population and Housing Census, announced in August 2023, unexpectedly counted Pakistan's population at 241 million. This count not only superseded the anticipated rate by about ten million additional Pakistanis but also presented a shocking rise in the intercensal average annual growth rate from 2.4% for the period 1998–2017 to 2.55% for the five-year period 2017–2023.

The 2023 census population figure for Pakistan exceeded all prior national and international population projections. For instance, the National Institute of Population Studies (NIPS) had projected the population to be 233.7 million based on 2017 census data (NIPS, 2021). Similarly, the 2019 UN world population projection suggested that Pakistan's population would reach 233.7 million in 2023 (United Nations, 2019).

While the results of the latest census require full evaluation for internal consistency, they reflect a widely held view that population growth is far from waning and is at levels that are double those of most countries of the region. Unfortunately, there has not been a major fertility survey since the Pakistan Demographic and Health Survey 2017–2018, and the shock and alarm regarding the high population growth rate could have been mitigated if the Pakistan Bureau of Statistics had been collecting regular demographic data at the provincial level on births, deaths, and growth rates. This could have provided a strong countercheck of intercensal growth rates and helped monitor demographic trends that have significant implications for all sectors.

Pakistan has been contending with persistent high fertility rates that are stagnating (Bongaarts and Sathar, 2024), coupled with the momentum of past growth. The implications of high population growth correlate with people's standard of living, health, education, income, and the provision of basic services such as transportation, housing, sanitation, and security. It is one of the main drivers of low per capita income, poor human capital, higher unemployment, higher gender inequality, heightened social vulnerabilities, and has implications for climate change.

The current economic crisis is stifling public investment, leaving the social sectors severely under-resourced. Recently, the human capital crisis in Pakistan has received considerable attention (World Bank, 2023). Sustained and high population growth poses a challenge to ensuring inclusive social and economic development in the country. Households living in poverty and in already underdeveloped regions are likely to slide back further. Furthermore, Pakistan will face serious challenges in meeting its Sustainable Development Goals (SDGs) by 2030.

In addition to existing vulnerabilities and vast inequities, Pakistan is one of those countries that has already been and will be more adversely affected by climate change. The 2022 floods were a manifestation of that change. The floods inundated around one-third of Pakistan, displaced approximately 33 million people, damaged 1.7 million households, and caused severe damage to livelihoods and the economy. While most discussions on loss and damage have focused on biophysical effects, such as loss of assets and erosion, less attention has been given to the significant decline in human development.

The World Bank's *Pakistan@100* (World Bank, 2019) examined what it would take for more Pakistanis to become prosperous and for the country to graduate to a high-middle-income economy. It highlighted the importance of fertility reduction in shaping crucial economic objectives. Additional World Bank reports have focused on investments in human capital, particularly addressing two important priorities for the Bank: reducing malnutrition and decreasing the out-of-school population as part of its agenda for brighter reforms (World Bank, 2023).

While there is frequent emphasis on prioritizing human potential and investing in human capital, there is a need to delve deeper into the underlying relationships that drive demographic trends, their contribution to societal and economic dynamics, and the impact of other sectors on demographic behaviors. This publication focuses on the often reciprocal relationships between demographic trends and key sectors, highlighting how demographic trends drive structural changes in these sectors and, conversely, how trends within these sectors have hindered demographic change.

Aims and Objectives of Pakistan@2050

With the Council of Common Interests (CCI) officially approving the results of the 2023 census, researchers must now examine what these population numbers means for Pakistan's future. The Population Council and UNFPA launched a study to assess Pakistan's demographic and economic outlook leading up to 2050. Analyzing the past few decades and forecasting the coming decades is critical to guiding the measures and policies that the federal and provincial governments need to prioritize.

The study aims to enable more effective policy formulation, requiring a deeper understanding of the relationship between population dynamics and the country's economic development. It also seeks to align with the Government's economic reform agenda. This study holds immediate significance for the Government as it develops its 13th Five-Year Development Plan for 2024–2028.

The study has the following objectives:

- To enhance our understanding of the significance of population dynamics for Pakistan's overall development, particularly examining the implications of population numbers and age structures for education, health, employment, urbanization, migration, climate change, among others.
- To provide a comprehensive analysis of past population dynamics and forecast future population trends based on various socio-economic scenarios until 2050, which will inform policy and strategic directions.
- To assess the economic cost of high population growth in the past and develop alternative case scenarios based on key demographic goals and targets that can shape future economic growth and ensure a demographic dividend.
- To explore the association between population dynamics, structural changes, and climate change.

Governance of Population: Population Policy, Programs, and Politics

After a long period of high population growth rates driven mainly by high fertility, Pakistan began experiencing a decline in fertility during the post-Zia period of 1988–2000. This era, marked by a return to democracy, saw population growth become a priority within the broader focus on social sectors under the Social Action Program. During this time, political commitment to reducing population growth rates as a development strategy was palpable, accompanied by progress in health, education, and other social sector indicators.

Notably, the initial decline from a total fertility rate of 6.2 children per woman in the 1980s to 4.8 children per woman in 2000–2001 occurred quite rapidly, raising high expectations for a continued downward trend. Pakistan witnessed the launch of community outreach initiatives, including the Village-Based family Planning Workers Scheme, followed by the larger Lady Health Workers Program, officially known as the Prime Minister's Program for Family Planning and Primary Health Care. Social marketing programs, which are now more than thirty years old, also began during this period. The Population Policy of 2002 aimed to achieve replacement level fertility by 2020 through the expedited completion of the demographic transition, entailing declines in both fertility and mortality rates. However, the 2002 population policy became ineffective in 2010 due to the 18th amendment to the constitution, which led to the dissolution of the Ministry of Population Welfare and the devolution of its functions to provincial Population Welfare Departments.

Unfortunately, the expectations of the 2002 Policy never materialized. Despite the return to democracy after the military coup in 1998 and three successive elected governments from 2007 to 2020, population concerns at the policy levels have diluted. Structural changes in the implementation of population programs, combined with fragmented relations between the Health and Population Welfare Departments responsible for delivering health services, including family planning, have contributed to an extremely slow fertility decline since 2010. Fertility rates have hardly changed, unlike the rest of South Asia, where they have fallen to an average of two children per woman during the same period. High

unwanted fertility is one factor, but even wanted fertility remains high. Pakistan is now considered an outlier in South Asia, with one of the highest total fertility rates of 3.6 births per woman in 2018 and a population growth rate above 2%. The slow fertility decline is particularly perplexing given the strong desire among Pakistani men and women for fewer children. While contraceptive use rates are low, millions of women with unmet need for contraception experience unplanned and unwanted pregnancies each year (Population Council, 2024). A faster decline still appears possible with the provision and expansion of fertility services to this substantial portion of the population.[1]

After the 18th Constitutional Amendment, it was argued that provinces should have become more directly involved and active in financing and implementing population policies. However, strong political economy factors counteract the narrative to lower population growth rates. The first is the National Finance Commission award, which assigns 82% weightage to population size. This serves as a major disincentive for provinces to fully implement programs aimed at reducing population growth and fertility rates. Secondly, with a parliamentary democracy that ties political representation to constituency population numbers for both national and provincial assembly seats, there is a significant incentive to exaggerate and even encourage population growth. While the gap in family planning service provision for millions of couples who wish to space or postpone births continues to widen, political economy considerations at both state and provincial levels often do not support policies that promote family planning programs or a reduction in population growth rates.

The most recent policy response aimed at reducing fertility and population growth rates occurred when the Supreme Court Chief Justice took suo motu notice of the alarming high population growth following the release of the 2017 Census results. These results revealed a shocking population growth rate of 2.4% per annum in the intercensal period from 1998 to 2017. This prompted the formulation of a task force that recommended key pathways to reduce the population growth rate. These recommendations were adopted by Pakistan's Council of Common Interests (CCI) in 2018 (NHSRC and LJCP, 2018) and were regarded as the highest-level policy commitment to reversing the country's population trajectory with a focus on fertility decline. These decisions were incorporated into the National Action Plan on Population, which stipulates a decline in fertility from an average of 3.6 to 2.8 children by 2025 and to 2.1 by 2030. Based on the earlier decline observed in the 1990s, these goals remain within the realm of possibility. The growth rate is expected to decline to 1.5% per annum by 2025 and to 1.2% by 2030. The CCI goals represent the primary policy of the Government of Pakistan, with all provinces and regions agreeing to their respective targets for 2025 and 2030.

In 2019, there was heightened expectation that the CCI goals would be taken seriously by the highest-level economic and social policymakers because they reflected the views of the CCI. However, five years later, there is a widespread perception of weak implementation of these decisions. To a large extent, the basics have not changed significantly.

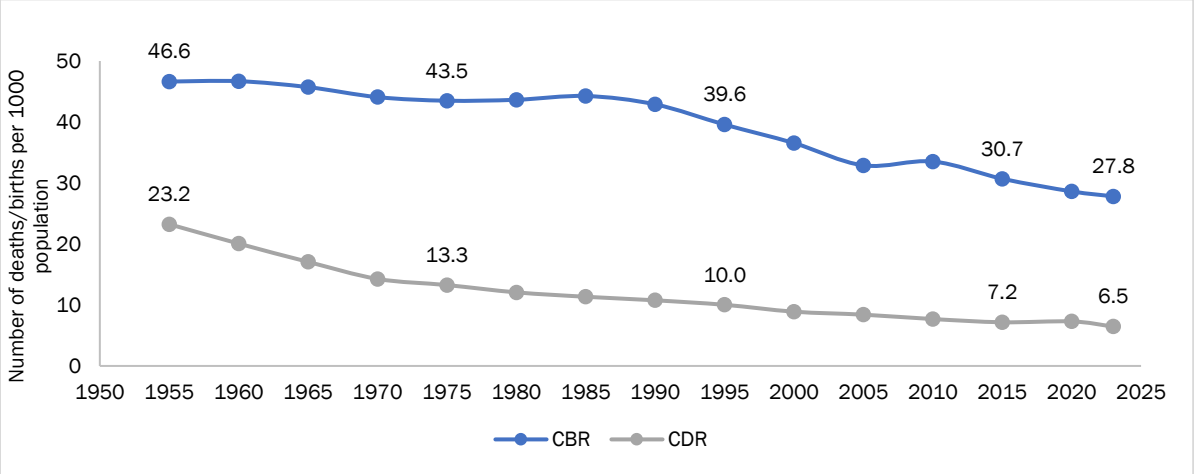
[1] In fact, both the federal and provincial governments missed the earlier opportunity for making the rapid fertility decline of the 1990s sustainable by not investing timely on female education, enhancing their employability and reducing child mortality. A recent study by Bora et al. (2022) attributed the impressive fertility decline in Bangladesh to increased women's education and the associated diffusion of smaller desired family size.

The government has made stronger verbal commitments, and nongovernmental organizations, along with select international partners, are providing assistance, but a clear commitment of funds is lacking. Health departments continue to focus on improving maternal health and nutrition while neglecting family planning services. A carefully crafted national narrative centered on the rights of women and children has emerged, grounded in Islamic principles of tawazzun, calling for a balance between resources and responsibilities that families and the state must uphold. This narrative, which has wide endorsement, including from the Council of Islamic ideology, emphasized the human rights of families and couples to have the means to decide their family size while seeking a balance between resources and population numbers. Despite growing recognition of the challenges posed by rapid population growth within religious and political circles, public discussion and discourse on this new narrative remain largely absent.

Overview of the Volume

Chapter 2 outlines major demographic trends over the past few decades, highlighting Pakistan's unusually slow demographic transition compared to other countries in the region. The first finding confirms that the demographic transition appears stalled midway. As shown in Figure 1.1, while crude death rates have declined steadily since the 1970s, crude birth rates only began to decrease two decades later, in 1990. Between 1990 and 2005, birth rates dropped sharply from 42.9 per 1,000 to 32.9 over a 15-year span. However, from 2005 to 2023, the rate has only inched down gradually, reaching 27.8 births per 1,000 over 18 years. Consequently, the rate of natural increase remains above 2.1% per annum.

Figure 1.1: Crude birth and death rates (deaths/births per 1,000 population) in Pakistan 1955–2023

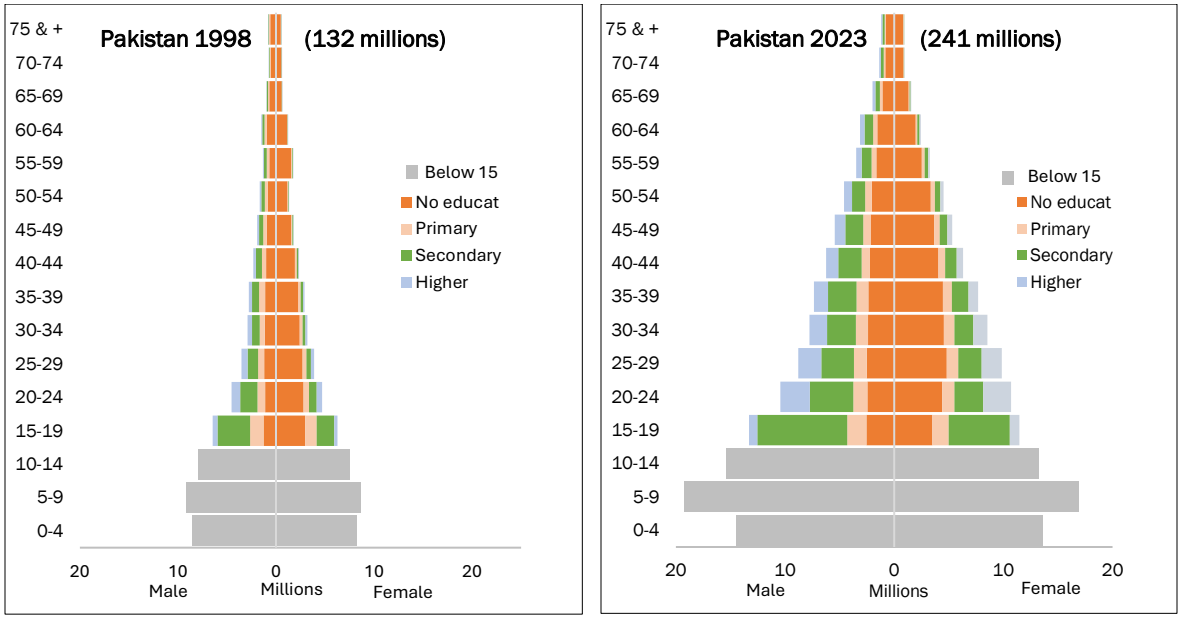


Source: United Nations, Department of Economic and Social Affairs, World Population Prospects (2024) (Figure 2.3).

The stalling fertility decline has resulted in practically no change in the total fertility rate since 2012, remaining at 3.6 children per woman (Chapter 2, Figure 2.4). This stagnation in fertility decline is attributed to minimal change in contraceptive use rates (Bongaarts and Sathar, 2024) and a persistently high demand for children (UNFPA, 2020).

The second finding highlights that high population growth rates have driven an exponential increase in the number of Pakistanis since the turn of the century. Over the past 25 years, the population has visibly surged, reflecting the incomplete fertility transition and a rate of natural increase over 2%. The chapter also points to slow progress in closely related sectors of health and education. The health sector, while showing a reduction in maternal mortality rates from 276 per 100,000 live births in 2007 to 186 per 100,000 in 2019 (NIPS, 2019), still struggles with high maternal mortality levels. The authors particularly emphasize the changing educational profiles of Pakistanis, illustrated by age sex pyramids segmented by educational level in Figure 1.2. While the number of educated Pakistanis has grown considerably, the majority of women remain uneducated. Although Pakistanis today are more educated than they were 25 years ago, gender differences are significant, with girls and women falling behind.

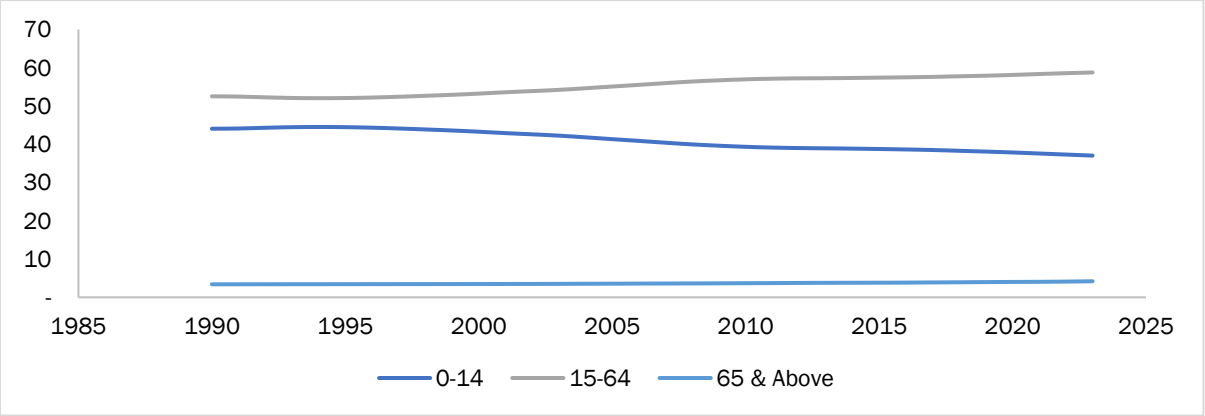
Figure 1.2: Age-sex and educational pyramid of Pakistan, 1998 & 2023



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Pakistan Integrated Household Survey (PIHS) 1998–1999, Pakistan Social and Living Standards Measurement Survey (PSLMS) 2019–2020, and population data from census 1998 and 2023 (Figure 2.13).

The third finding in this chapter confirms the huge expansion of the labor force, with an additional 3 million people joining the working-age population each year (Chapter 2, Table 2.3). The share of the working-age population has risen gradually from 53% in 2000 to 59% in 2023 (Figure 1.3). This trend is expected to continue until 2040. While this presents an opportunity, it is also contingent on the economy's ability to generate sufficient employment opportunities. Notable demographic changes are also evident in the age structure, particularly in the declining dependency ratio, which has decreased from 90.4 in 1990 to an estimated 70.2 today. These changes are directly related to the potential for a demographic dividend, a topic explored in subsequent chapters.

Figure 1.3: Percentage share of different age groups in Pakistan, 1990–2023



Source: United Nations, Department of Economic and Social Affairs, World Population Prospects (2024) (Figure 2.10).

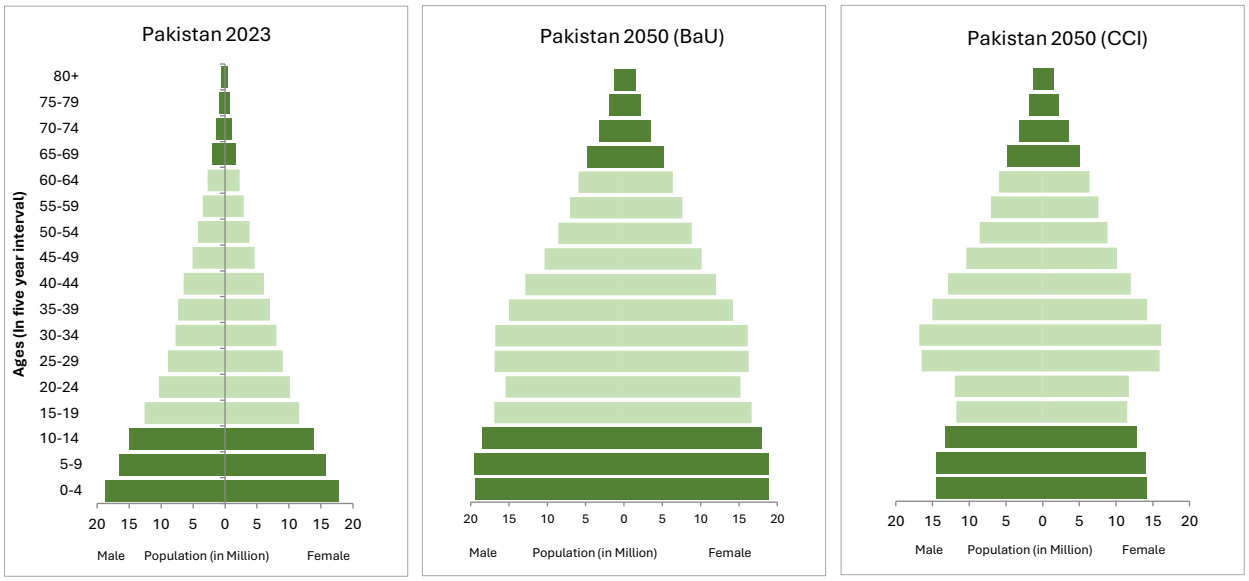
Chapter 3 comprises projections and scenarios of Pakistan's future demographic situation, proposing that if Pakistan prioritizes two key policy actions to which it has committed, significant progress can be achieved. The first action is the CCI goal of reaching replacement-level fertility by 2030, with a total fertility rate of 2.1. The second is the enforcement of universal primary education by 2030. While hugely ambitious, these goals reflect the country's commitment to shaping its future thoroughly focused demographic and educational policies. The study emphasizes that well-targeted policy decisions can have immediate, significant impacts and create far-reaching intergenerational effects. Under the CCI scenario, Pakistan's age structure shifts, reducing the proportion of dependents (children) and increasing the working-age population (Figure 1.4).

While Pakistan has yet to experience a very sharp decline in fertility, there are several regional examples of rapid fertility transition. For instance, Nepal saw a fertility decline from 4.1 children per woman in 2001 to replacement fertility of 2.1 in 2022. Similarly, Iran underwent a swift fertility transition starting in 1992. This chapter emphasizes the multiple pathways between education and population trajectories, with a primary focus on how women's fertility rates vary by educational level. The most data reveal a difference of 1.8 children between women with no education and those with higher education. Although these figures, drawn from the Pakistan Demographic and Health Survey 2017–2018, may have shifted, the principle remains that female education is one of the most significant influences on fertility rates.

Hypothetically, if the balance shifts swiftly in favor of girls' schooling, and a large cohort of younger, educated women enters their reproductive years, this could lead to a rapid decline in fertility rates. Another influence is the trade-off parents make between the number of children they have and the investment they expect to make in their education. This decision largely depends on the returns to schooling in terms of employment and income opportunities. In Pakistan, where more than 20 million children are out of school, there is active debate about enforcing universal primary education. The Prime Minister of Pakistan declared an education emergency this year, which, if implemented, could affect the demand for children and influence the choices parents make regarding family size. Caldwell's demographic transition theory (1980) based mainly of whether flows are from parents to

children or vice versa, strongly supports the impact of primary education on demographic transitions, claiming that one generation of universal primary education is necessary to initiate a full demographic shift.

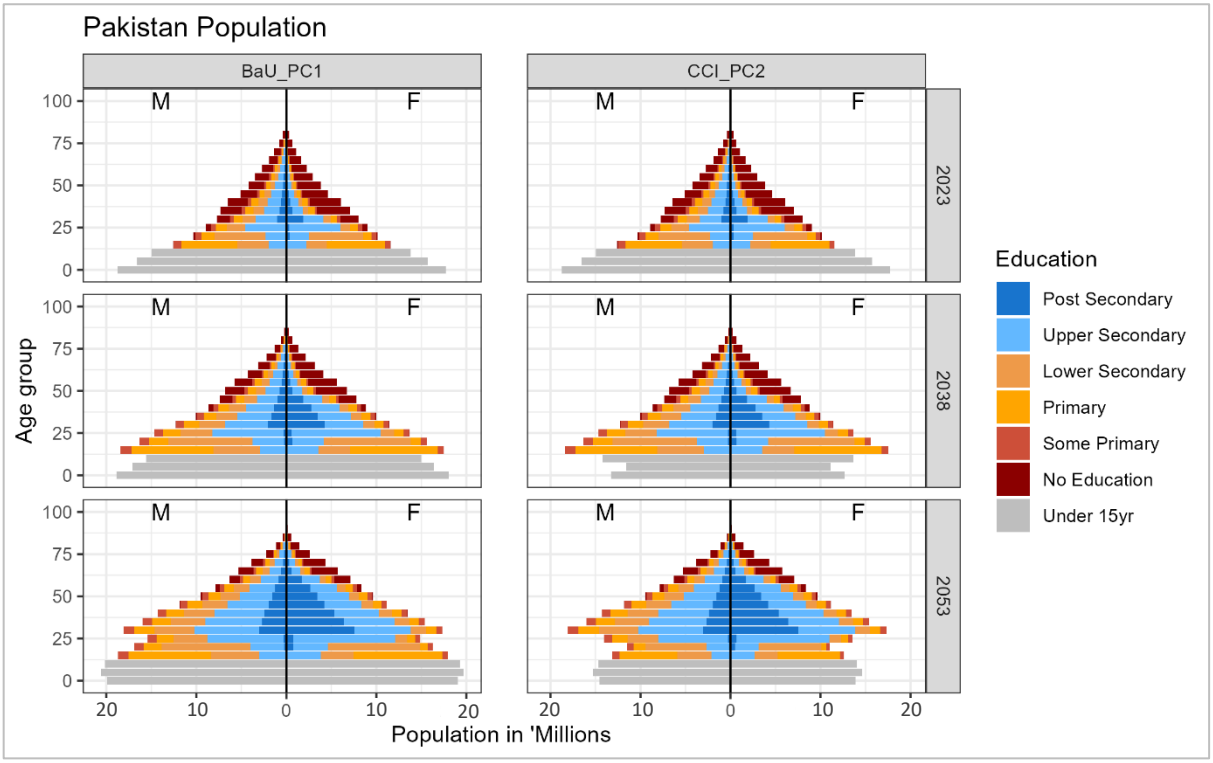
Figure 1.4: Population pyramids of Pakistan under the Business as Usual (BaU) & CCI Scenario, 2023 and 2050



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Population and Housing Census 2023 data as a base for population projection under different fertility assumptions (Figure 3.8 & 3.9)

The analysis includes the potential impact of both options on the education-age pyramid, showing that by 2050, Pakistan could become slightly less populous and more educated (Figure 1.5). The model incorporates the effects of a drastic reduction in fertility aligned with the CCI goals, coupled with the impact of a generation achieving universal primary education and aging into reproductive years, which further influences fertility rates. By 2038, changes become evident in both scenarios intensifying dramatically by 2052.

Figure 1.5: Pakistan's population structure by age, sex, and educational attainment in two scenarios, 2023, 2038, and 2053



Source: Figure 3.12

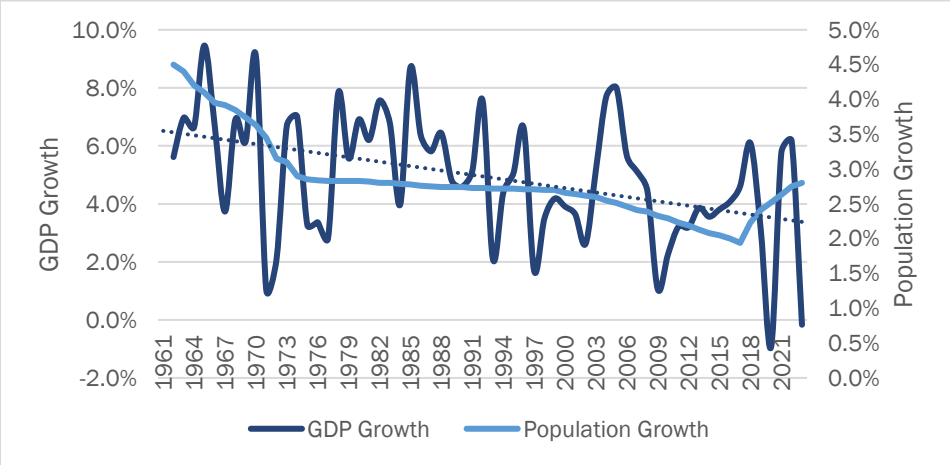
The authors go further to examine the implications of fertility assumptions based on the BaU Scenario, which directly affect the number of school and teachers required. They also address the challenges posed by a steadily increasing labor force—most of whom are already born and aged under 24—who will enter the workforce by 2030 and certainly by 2050. Given changes in population size and structure, along with rising participation rates, especially among women, the number of jobs that need to be created annually will increase from 2.5 million now to almost 3 million in 2035–2040, before levelling off at 2.6 million. In other words, the Government of Pakistan needs to create an additional 13 million jobs over the next 5 years to new labor market entrants. Another important consideration is the expected rise in female labor force participation, so job creation estimates and strategies should also account for the projected increase in female labor force participation, along with those who are unemployed or underemployed.

Chapter 4 re-examines, with fresh evidence, the long-standing but unresolved debate regarding the economy and demographic processes. The author essentially poses the following questions: Does population growth hinder or promote capital accumulation and innovation? Is population growth a cause or effect of declining economic wellbeing and poverty?

One of the fundamental challenges facing Pakistan is creating reliable economic forecasts for the near and medium-term future. The chapter lays out clear options and illustrates the two-way relationship, focusing on how different levels of adherence to a faster fertility decline could alter economic growth, per capita income, and particularly savings.

These have been the primary concerns for the government over the last five years, but few studies have provided such detailed, in-depth analysis. The author begins by analyzing past secular trends in economic and population growth rates, which generally show a negative association despite peaks in economic growth in 2005, 2018, and 2022 (Figure 1.6).

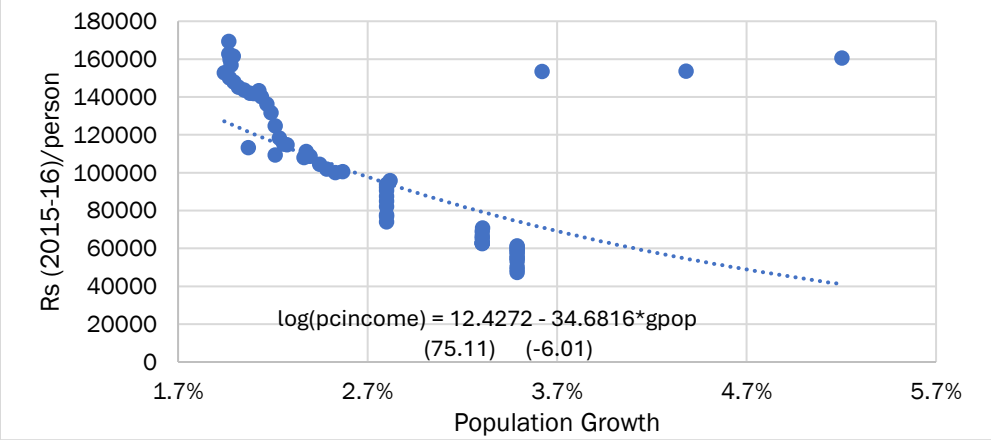
Figure 1.6: Trends in population and GDP growth



Source: Figure 4.1

The author first examines the impact of a fast-growing population on GDP and per capita income growth. Figure 1.7 illustrates the relationship between real per capita income (in 2015–2016 prices) and population growth in Pakistan from 1961–1962 and 2022–2023. The data show that if population growth increases by one percent, real per capita income declines by over Rs 35,000 per year—about one-third of the average per capita income for the period.[2] This estimated relationship, which spans 61 years, is robust enough to challenge the notion that the negative relationship between population growth and per capita income holds only in the short run.

Figure 1.7: Per capita income and population growth



Source: Figure 4.2

[2] The figure is based on Ministry of Finance (MOF) data. There are three clear outliers to the trend of population growth corresponding to the years 2015–2016, 2016–2017, and 2022–2023; these are the census years. Perhaps MOF has tried to "force" its population estimate to conform to census estimates.

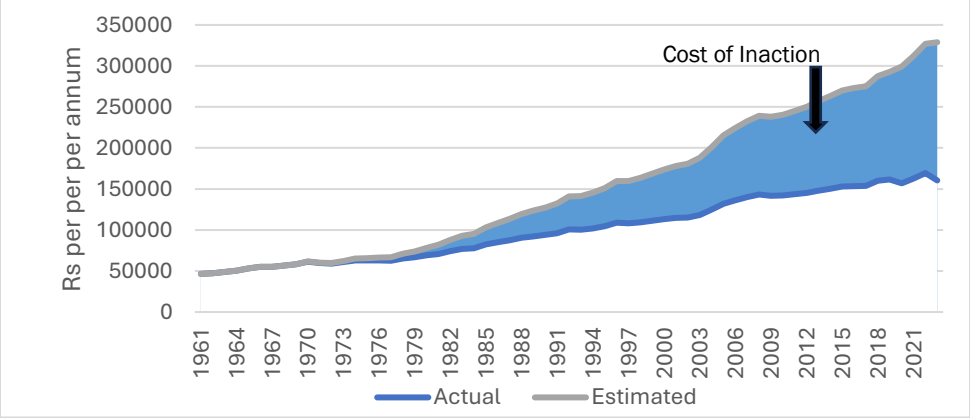
The second pathway linking a larger population to economic growth is its effect on labor productivity. As capital accumulation slows due to reduced savings, the capital per worker (i.e., the capital-labor ratio) decreases. A higher capital-labor ratio generally correlates with greater labor productivity, so a decline in this ratio implies a drop in labor productivity. Pakistan's labor productivity has shown minimal growth (Chapter 4, Figure 4.4).

Comparing Pakistan with India and Bangladesh, by 2005, Pakistan's labor productivity was 33% higher than India's and 40% higher than Bangladesh's. At that time, India had a capital-labor ratio comparable to Pakistan's, while Bangladesh's ratio was about half. However, due to lower investment levels, by 2019, India's capital-labor ratio was 130% higher than Pakistan's, and Bangladesh's ratio was 3% higher. Moreover, Pakistan's human capital, measured by average years of schooling, has consistently lagged behind both countries.

Another critical pathway is the impact of rapid population growth, which diverts resources away from key investments. A larger population demands greater government spending on social safety nets, education, health, and food security—thereby redirecting funds from more productive, growth-oriented public and private investments. While such expenditures may build human capital, they also shift investment from short-term physical capital to longer-term human capital, impacting economic growth, particularly in the short run. In Pakistan, overall investment has been trending downward. Total investment in the country shows a steady increase in the share of social sectors (from 14% in 1999–2000 to 31% in 2022–2023), while shares for infrastructure and production sectors have declined (Chapter 4, Figure 4.6). This shift in social spending is largely a response to serve the needs of an exponential rise in the numbers of Pakistanis since 1990, rather than an increase in the levels of social services being provided.

One of the most important contributions of Chapter 4 is the computation of the Cost of Inaction, comparing key economic outcomes from the two demographic scenarios in Chapter 3—a sharp fertility decline versus business-as-usual slow decline. The empirical evidence is irrefutable: high population growth has significantly contributed to Pakistan's declining economic performance. Under a sustained higher rate of economic growth, real GDP today would be 56% higher, and the per capita GDP would be double its current level (Figure 1.8).

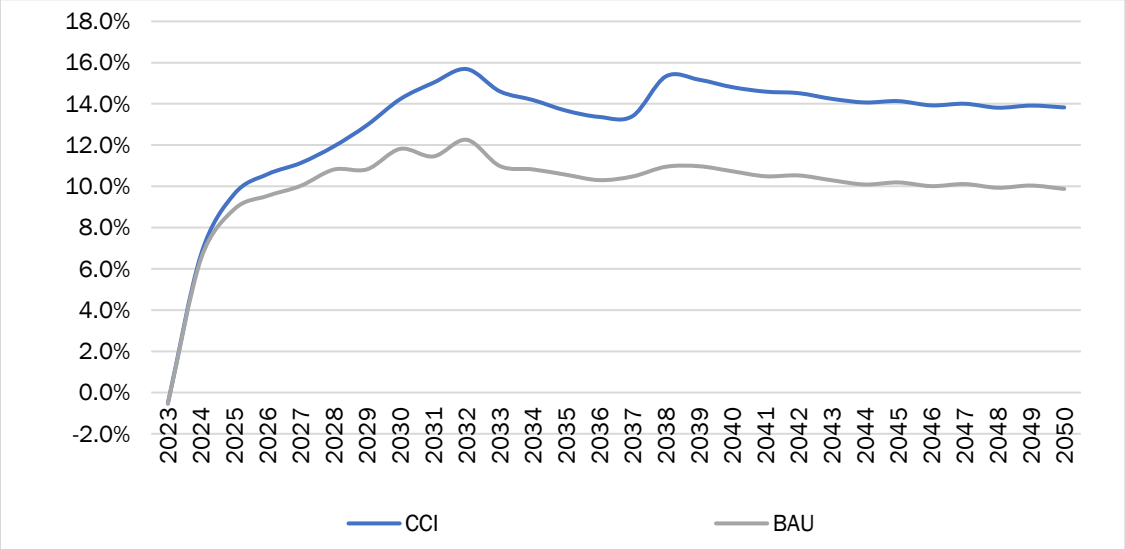
Figure 1.8: Trends in actual and estimated per capita GDP



Source: Figure 4.15

The author predicts that, by combining two demographic and two economic scenarios, the investment rate will rise from 11.8% in 2013 to 14% in 2032. The biggest change in projections is in the investment rates, which will be 6.5% higher in 2050 under the Council of Common Interest (CCI) scenario compared to the Business-as-Usual (BaU) scenario (Figure 1.9). With a low initial base, improved savings and investment rates, and slower population growth, GDP growth is expected to reach 3.9% per year by 2032. However, as the base effect slows future growth, this rate is projected to gradually decline to 3.4% per year by 2050.

Figure 1.9: Savings rates under Business-as-Usual and Council of Common Interests scenarios, 2030–2050

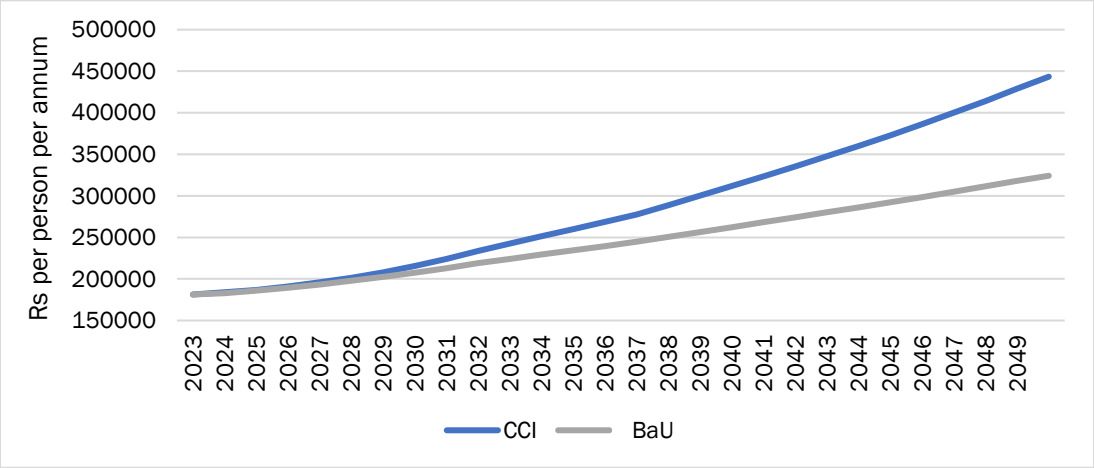


Source: Figure 4.18C

GDP growth will be higher by only 170 basis points, as the base effect weighs down economic growth more than it does for savings and investment (Chapter 4, Figures 4.18B, C, D). Higher GDP growth and remittances, coupled with lower population growth, will result in significantly higher per capita income under the CCI scenario compared to the BaU scenario. Due to higher GDP growth, increased remittances, and lower population growth, the average growth in per capita income under the CCI scenario (3.4% per annum) is significantly higher than under the BaU scenario (2.2% per annum).

In 2050, per capita income under the CCI scenario will be 37% higher than under the BaU scenario (Figure 1.10). This difference in the level and growth of per capita income under the two scenarios implies that the level of headcount poverty under the CCI scenario is likely to be significantly lower than under the BaU scenario.

Figure 1.10: Per capita income under Business-as-Usual and Council of Common Interests scenarios, 2030–2050

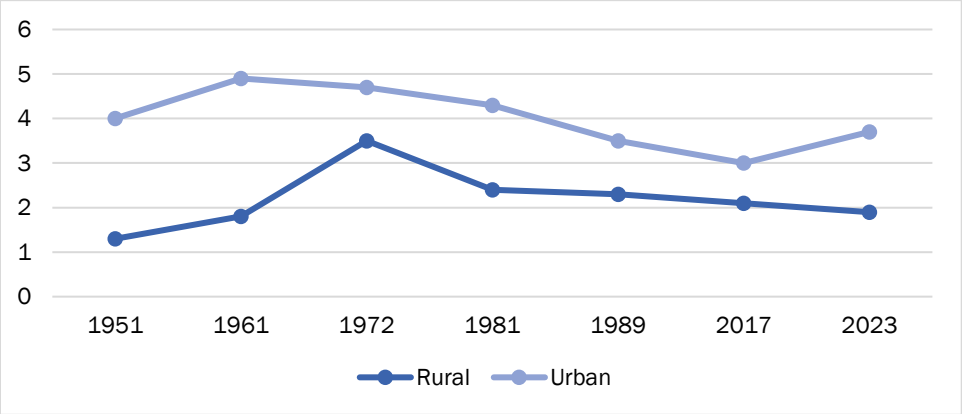


Source: Figure 4.18E

We believe that the analysis of Chapter 4 unequivocally refutes the argument, in the case of Pakistan, that rapid population growth has been positive for economic outcomes. The chapter demonstrates that a population is an economic resource only if every additional person added to the labor force produces more output than they consume. In other words, average labor productivity must exceed average consumption for the population to be self-sustaining. The reality is that Pakistan is facing savings and investment rates that are abysmally low. As a result, labor productivity has been in continuous decline. Pakistan is thus caught in a cycle where high population growth leads to a high dependency ratio, resulting in low savings, reduced investment, diminished labor productivity, and ultimately slower economic growth. Pakistan avoided this vicious cycle until the 1990s by mobilizing sizable and relatively inexpensive foreign resources. However, these resources have started to become increasingly limited and much more expensive, causing the vicious cycle to become more pronounced. The chapter demonstrates that the most effective mode of breaking this vicious cycle is to reduce population growth.

Chapter 5 extensively covers the intertwined processes of migration and urbanization that dominate the development landscape of Pakistan. To begin with, Pakistan is characterized by high mobility, especially from rural to urban areas, which has continued through the past few decades. As a result, the urban growth rate has overtaken the rural growth rate (Figure 1.11). While much of this is due to high levels of mobility and migration from rural to urban areas, the major contributor is actually the high rate of natural increase in urban areas (Arif et al., 2022). Therefore, unlike earlier decades, it is urban growth that is the dominant contributor to overall population increase in Pakistan.

Figure 1.11: Average annual population growth rate (%)

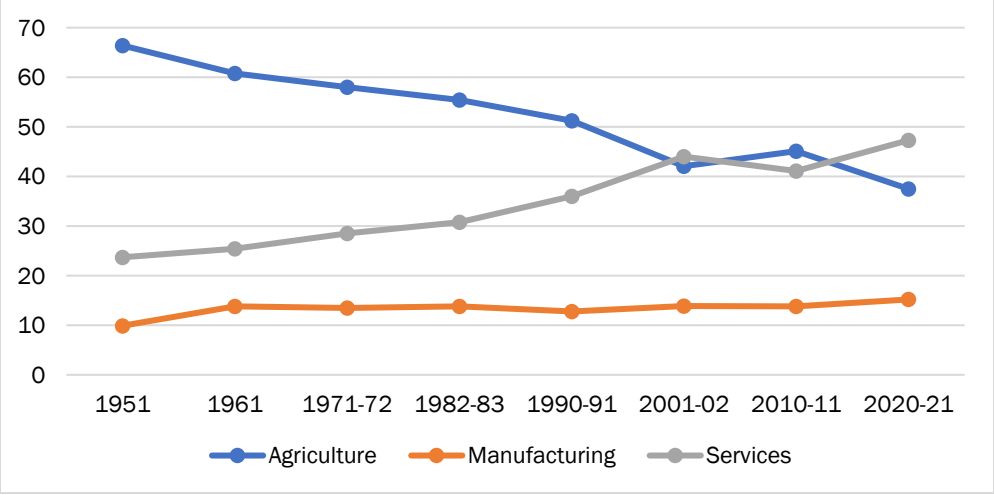


Source: Figure 5.12

Undoubtedly, Pakistan has experienced consistently rapid urbanization. Chapter 5 questions whether this urbanization has been accompanied by other structural changes. Pakistan will most definitely be 50% urban by 2050, but the key question this chapter addresses is whether the social and economic fabric will shift from a primarily agricultural economy with values rooted in rural behaviors.

The author examines the roots of migration and the transition from the agricultural economy to a more modern industrializing state. This is a route followed by most countries. The author discusses the nexus of migration, urbanization, and structural transformation, assessing that, above all, while the industrial and manufacturing sectors have contributed little to attracting labor mobility from the traditional low-productivity agriculture sector to manufacturing, the urban services sector has compensated for and absorbed the growing labor force in urban areas. Disguised unemployment in the agriculture sector remains high; despite contributing 20% share in GDP, this sector employs nearly 40% of the labor force (Figure 1.12).

Figure 1.12: Trends in industrial composition of employed labor force in Pakistan, 1951–2021



Source: Figure 5.3

Secondly, the author argues that the push factor for rural-to-urban migration may not be so much the lack of rural development, but rather the demographic pressure in rural areas, reinforced by poverty, which may have generated migratory flows. The continuing high rates of poverty in rural areas is a significant factor behind out-migration from rural areas. This reflects the inability for agriculture to absorb the rural labor force.

Thirdly, and relatedly, despite several challenges and issues, such as the mushrooming of slums and low-quality housing, urbanization has demonstrated resilience through the growth of the services sector, contributing to GDP growth. This sector is the major source of employment opportunities for the growing labor force. Importantly, opportunities for a better quality of life are still perceived by the rural poor in Pakistani cities and towns.

Fourthly, the fertility transition in Pakistan has been slow, delayed, and stalled, including in urban areas. The author proposes that while urban growth is driven by the large natural increase in urban populations, there is an increased likelihood that the desired level of replacement fertility may soon be achieved in the urban areas of the country, based on urban-rural fertility differentials trends in Pakistan.

Fifthly, the author elaborates on overseas migration trends, which he views as an opportunity for the growing labor force. Pakistan has experienced waves of international migration in earlier decades, initially to the United Kingdom and Europe, and later to the Middle East. However, these migration patterns have begun to decline, with considerable return migration since the Covid-19 pandemic. This has sparked a vibrant debate within Pakistan, with some promoting the idea that international migration is increasing because young people are fleeing the country in search of opportunities. Others argue that Pakistan's expanding labor force is an asset, as many can migrate abroad and that remittances will serve as a source of income for the country. The author points out that international out-migration is not at the scale it was during 2011–2020, and considerable return migration may be happening. He argues that the return of skilled emigrant workers with remittances constitutes a "brain gain" for the country. Finally, while significant improvements in structural transformation in the short term, such as over the next decade, are unlikely, the long term outlook appears promising by 2050.

The contribution of Chapter 6 lies in reinforcing the importance of development and structural changes associated with development, with a sharp emphasis on women and girls and their development trajectories. While advances in agricultural technology could potentially alleviate pressures driving high fertility rates, evidence suggests that such improvements may have limited impact in regions with low education rates. In such cases, addressing educational disparities and promoting women's economic participation may be more effective strategies for reducing fertility. The authors argue that countries like China and South Korea saw significant fertility declines alongside rapid structural transformation. In contrast to historical trends in the West, where fertility declines typically followed the shift out of agriculture, in East Asia, fertility declines often preceded or coincided with this transition. This suggests that educational improvements, particularly for women, may be as important as, or even more crucial than, structural transformation alone in driving fertility change. Although structural transformation creates the conditions necessary for fertility decline by

challenging traditional norms related to family size, education, particularly for women, appears to be a powerful mediator and catalyst in this transition in Pakistan.

Similarly, the authors note that there is a well-documented global trend linking increased female labor force participation to decreased fertility rates.[3] This negative relationship is often attributed to the concept of opportunity cost. As women gain greater access to education and jobs, the time and financial resources dedicated to childbearing become more costly, which can lead women to delay childbirth or choose to have fewer children overall. However, it is important to note that the relationship between fertility and women's work choices is bidirectional. It is difficult to determine definitively whether having children leads women to work less, or if women who choose to work less tend to have more children. The literature points to four main factors contributing to a disconnect in this relationship in Pakistan.

First, data does not reflect female economic participation in the informal sector, which is likely higher than formal participation, but also consists of low-paying, precarious jobs. These jobs may not provide the same level of improvement in household income and/or high opportunity costs of a woman's labor that would encourage a reduction in desired fertility. Additionally, the share of unpaid family helpers is much higher among the female labor force than their male counterparts.

Second, recent evidence suggests that gender preferences keep desired fertility high. Unlike in developed countries, women in developing nations like Pakistan make decisions about having children and working based on the number of children who survive, rather than the total number born. This is due to high child mortality rates in these countries. In some areas of Pakistan, since sons are more likely to die young, women might have more children overall, hoping for at least one surviving son.

Third, the authors suggest that the type of employment is important: working in factories with stable income empowers women and enhances their autonomy, which may influence their fertility decisions differently than the widespread informal sector jobs in which many women are engaged. This distinction could help explain the observed effects.

The fourth factor, perhaps the most stubborn to change, are societal norms regarding women's status, regardless of their employment status. Despite a half-century of societal evolution, South Asian women have experienced limited progress or even regression in various norms, including labor force participation, age at first birth, and agency. Therefore, while the global trend suggests a connection between female economic participation and lower fertility rates, the authors argue that there is a weak association in Pakistan. Until women in Pakistan have greater access to decent work, childcare, and until cultural norms around childbearing evolve, it is unlikely that female labor force participation alone will significantly impact fertility rates.

The authors offer the following key insights for charting the way forward: prioritizing investments in education, especially for women, as a key strategy for promoting fertility decline. Education enables women to transition out of a primarily agriculture-based workforce, resulting in greater access to

[3] On average, as female labor force increases, fertility rates decline. However, the average correlation is weaker in low-and-middle-income or developing countries.

employment opportunities outside of that sector. Additionally, education improves agency and health knowledge, which enhances child health. These two forces have the potential to reduce desired and actual family size. This argument is supported by research in Asia that highlights the importance of educational attainment in driving fertility decline.

Second, while a negative association between women working and fertility rates is observed globally, the labor force participation rates in Pakistan have remained unchanged at under 25% in the last ten years. This has probably contributed to a stall in fertility decline. Evidence indicates decent work—defined as a safe work environment and competitive pay—can meaningfully influence fertility reduction.

Third, the lack of access to affordable education and healthcare, particularly for girls, reduces investment in children. Evidence suggests that supporting educational costs can decrease reliance on children to work.

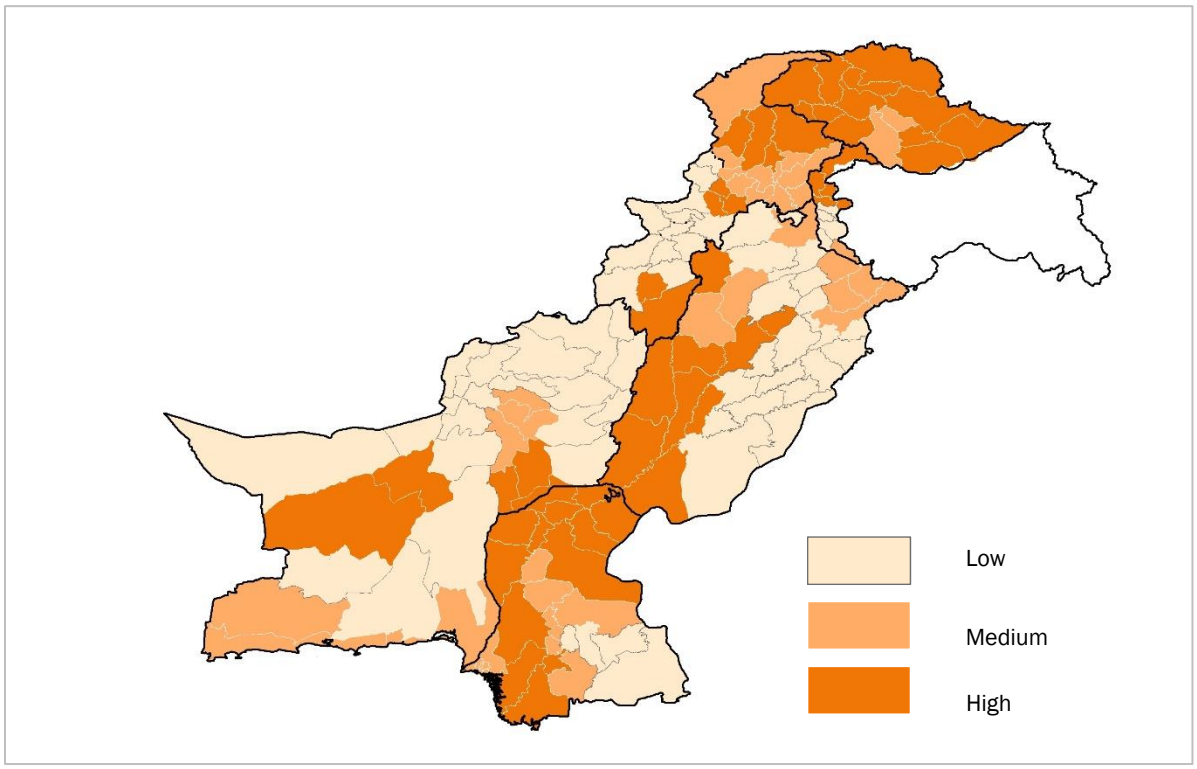
Chapter 7 presents the impact of climate change and its interaction with population increase and density as significant challenges for Pakistan's development. Although Pakistan contributes minimally to global emissions, it continues to experience severe negative impacts of climate change including rising temperatures, climatic events such as rising sea levels, glacial lake outburst floods, and particularly frequent monsoon floods. All these events adversely affect the incomes, livelihoods, and health of the population across the country. Pakistan faces different types of natural hazards almost every year.

The author describes the major geographic regions affected by climate risks, starting with seawater incursion, followed by flood and drought hazards. The flood hazard map in Figure 1.13 categorizes districts into low, medium, and high flood hazard zones.[4] The flood-prone areas, particularly those along the Indus River in Khyber Pakhtunkhwa, Punjab, and Sindh provinces, are depicted in dark orange, indicating a high flood hazard. These regions are densely populated due to their fertile agricultural land, which supports a significant portion of Pakistan's agrarian economy. However, frequent flooding in these areas has severe consequences: economically, floods can cause extensive damage to crops, infrastructure, homes, and businesses, leading to substantial losses. The agricultural sector is particularly vulnerable, with crops being destroyed and soil fertility being adversely affected.

Displaced populations face challenges regarding shelter, access to clean water, sanitation, and healthcare, exacerbating their vulnerability.

[4] The dataset combined these two parameters and classified the districts on a three-point scale of hazard levels from 1 to 3, denoting low, medium, and high, respectively. Figure 13 presents the map showing flood hazard index, showing the level of flood risk faced by different districts across Pakistan

Figure 1.13: Flood hazard index across districts of Pakistan

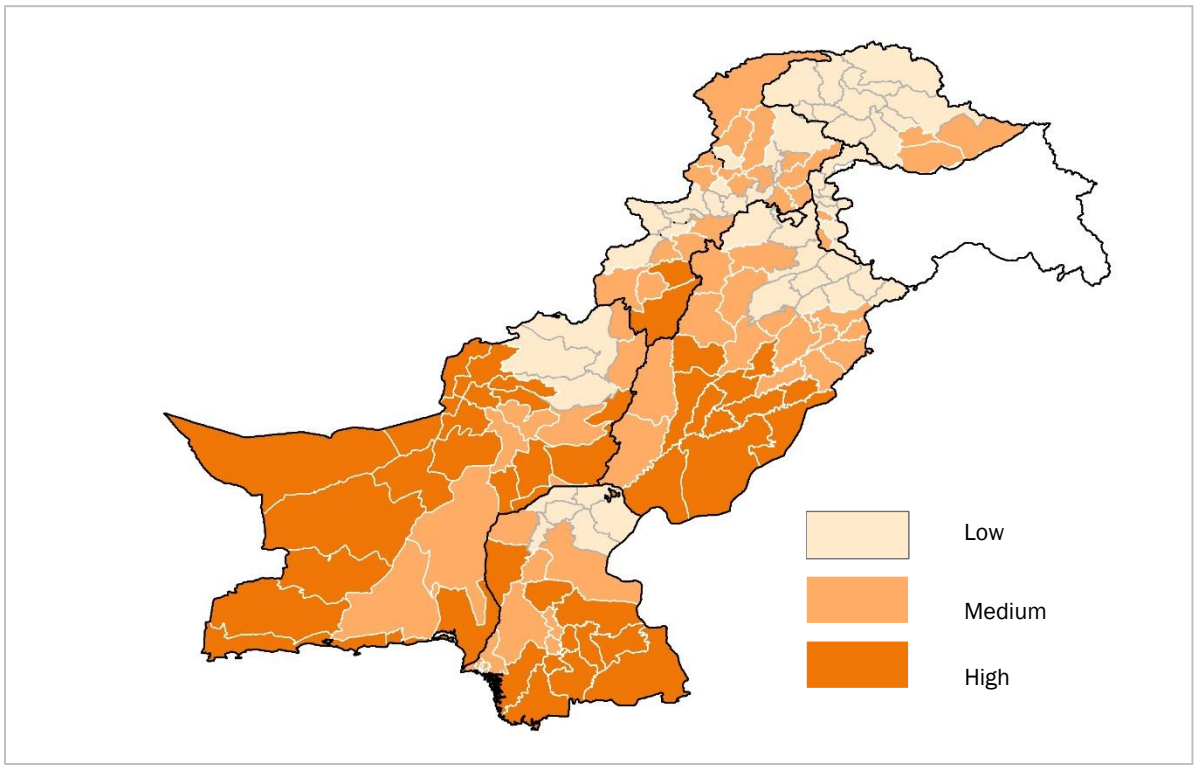


Source: Integrated Context Analysis (Government of Pakistan, 2017) (Figure: 712).

The drought hazard map in Figure 1.14 highlights districts with varying levels of drought hazard, categorized into low, medium, and high zones.[5] High drought hazard areas are depicted in dark orange, primarily located in Balochistan and parts of Sindh and Punjab. It is interesting to note that these regions are less densely populated than flood-prone areas but still face significant challenges due to their dependence on agriculture and livestock farming. Drought exacerbates water scarcity issues, affecting drinking water supplies and irrigation systems, which can lead to conflicts over water resources and force communities to migrate in search of better living conditions. Prolonged droughts can lead to malnutrition, particularly among children, as food supplies dwindle.

[5] Drought hazard index data has been computed using data on soil moisture and precipitation from 1951 to 2010.

Figure 1.14: Drought hazard index across districts of Pakistan



Source: Integrated Context Analysis (Government of Pakistan, 2017) (Figure: 7.13).

The author includes original analysis of the impacts of climate change on key outcomes at the household and district levels. The regression analysis based on district-level data shows that, on average, a one-degree Celsius increase in average temperature at the district level, results in an almost 4% decrease in income, while a one-centimeter increase in average precipitation is associated with a 0.48% increase in income.

Another set of regressions run at the household level for rural areas reveals significant negative impacts of temperature rises due to climate change on agricultural productivity and livelihoods. These findings have critical implications for urban areas as well, since reduced agricultural yields can lead to increased food prices and food insecurity, which disproportionately affect urban populations, especially the poor. Additionally, diminished rural livelihoods may drive rural-to-urban migration, intensifying the strain on urban infrastructure,

Results frommodelling indicate that household members from districts with a one-unit higher index of flood hazard have a 1.2 percentage point higher probability of out-migration. Similarly, household members from districts with a one-unit higher index of drought hazard have a 0.9 percentage point higher probability of out-migration. The results of this model reveal a quadratic relationship between out-migration and temperature. As temperatures rise, the out-migration rate initially declines, reaching a minimum point, and then begins to increase. This pattern indicates that districts with both very low and very high temperatures experience higher out-migration rates compared to those with moderate temperatures.

The author presents extensive literature substantiating that decreasing fertility is a potential adaptation policy when considering climate-induced damages. The author's own analysis finds that households with a one-unit higher child dependency ratio have almost 9% lower income. This indicates that households with a higher child dependency ratio spend more of their budget on consumption goods and less on investment goods, leading to a lower level of income. Additionally, analysis of households in Pakistan shows that flood hazards, drought hazards, and overall climate change lead to higher out-migration rates.

The author concludes that, given the uncertainty of future climate conditions and the projections indicating average temperatures exceeding 1.5 degrees Celsius in all but the low emission scenario, it is crucial for Pakistan to consider the interplay between climate change and population dynamics for 2050. Reducing fertility rates can play a significant role in climate mitigation and adaptation over the next 25 years. If current fertility rates persist, the rapidly growing population will exacerbate the adverse impacts of climate events, leading to increased food and water scarcity, heightened health risks, and more frequent displacement. By 2030, this could result in a significant portion of the population being affected by climate events, with the situation worsening by 2050. In contrast, a rapid decline in fertility rates would lead to more manageable population growth, thereby reducing the strain on resources and enhancing the overall resilience of communities to climate impacts.

Looking Forward

Twelve years ago, while writing the overview of *Capturing the Demographic Dividend in Pakistan*, (Sathar, Royan and Bongaarts 2013) Pakistan faced a very similar demographic and economic situation. The difference was a confident certainty that demographic trends that had started to change would continue. The fertility declines of the late 1990s, from a total fertility rate of 6 to 4 children, had already translated into declining dependency ratios and a confirmation of a period of a potential demographic dividend. However, now, twelve years later in 2024, there is serious concern about the slowdown of those trends and a period of virtual stagnation over the last ten years. The very forces that were expected to drive demographic change have, in fact, become impediments or roadblocks to achieving a dividend and completing the fertility transition in Pakistan.

This volume goes beyond the usual components of population dynamics—fertility, mortality, and migration—to extend into the economy, vital components of gender and human development trajectories, and the climate challenges facing Pakistan. The realities facing Pakistan in 2024 include high population growth rates, a fertility transition that appears to be stagnating midway through completion, a staggering economy, and a society caught between traditional and modern influences. Pakistan is battling stagnancy in demographic features almost parallel to economic stagnation, which partially explains the standstill in many aspects of demographic change, particularly static fertility rates and demand for children.

The demography of Pakistan has to be reconceptualized within the framework of its overall realities. While this volume cannot cover many aspects beyond its scope, it attempts to explore not just demographic analysis of possible numbers, age structures, and projections up to 2050, but also the factors that may intervene to bring about changes in Pakistan's population by 2050. The major

sectoral linkages that dominate the discussion are economic trends, the role of structural change—particularly the transformation from an agriculturally dependent economy to an industrial one—the fundamental role of women, and the profound transformations that greater education and employment opportunities for women and girls can bring to demographic dynamics. This occurs amidst uninterrupted urbanization in Pakistan, characterized by migration as a major feature of Pakistani life, and the emerging threat of climate crises on demographic behavior, particularly concerning displacement.

Each chapter is a standalone piece, yet all are interconnected. The volume assumes that the current stalled fertility transition will result in little change in the size and structure of the population. However, the important decisions made by the CCI and the government's current policy since 2018, if followed, could dramatically change Pakistan's demographic profile. It remains uncertain what progress has been made in implementing the CCI policy directives, as there are no national or provincial surveys measuring fertility or contraceptive use to establish progress against the goals set in 2019. However, given the results of the 2023 Census and a recent report estimating induced abortions and unwanted pregnancies at 3.8 million, with an abortion rate of 55 per 1000 (Sathar et al., forthcoming), there is evidence contrary to an increase in contraceptive use levels.

Once again, we are largely reiterating the same recommendation from the last ten years: Pakistan must improve efforts to increase contraceptive demand and reduce the demand for children to achieve a rapid fertility decline. This is possible due to the high unmet need for family planning, as evidenced by the rise in the abortion rate between 2012 and 2023 (Sathar et al., forthcoming).

This volume presents compelling evidence about the importance of other sectors in determining demographic change. Above all, education—especially female education—emerges as a significant factor influencing future population projections (Chapter 3) and structural changes that would alter the basis of demand for children, as well as considerations surrounding fertility values and behavior (Chapter 6), and climate adaptation (Chapter 7). Pakistan's gender disparities and reluctance to introduce gender equity policies have undoubtedly hampered social and economic development. The continuing disadvantages faced by women and girls in terms of literacy and enrollment rates, as presented in Chapter 2, continue to hinder changes in fertility and other demographic processes. Similar concerns are raised about the stall in female labor force participation across Chapters 2, 3, 4, and 6.

The volume provides sufficient evidence from Chapters 2,3 and 4 to substantiate the debate about the quantity versus quality in terms of educated Pakistanis at both the household and economic levels. Clearly, Pakistan has not invested sufficiently in human capital to reap the additional value of having larger cohorts and lower dependency ratios, thus failing to achieve anything close to a demographic dividend at the present time. The volume emphasizes the need for further research on the links between low levels of enrollment of children and the tradeoffs that parents face across economic groups regarding the number of children they desire. We need to unpack the rates of return on investments in children and the continuing preference for sons, affecting many household decisions.

A lingering debate continues to prevail within Pakistan about whether Pakistan's growing population should be viewed as an asset or a liability. There is ample analysis across the chapters to fuel and settle the debate.

Related to this is the opportunity for Pakistan to become a high-middle-income economy by 2047, as highlighted in a significant World Bank report (World Bank, 2019). Chapter 4 outlines how closely economic performance is related to demographic trends, emphasizing how growth, per capita income, savings, and investment have been hampered by rapid growth rates. It also underscores the flat trends in labor productivity, which have negated the expectation that an increase in the labor force would yield dividends. The cost of inaction in the past is substantial, but the cost of not acting upon the CCI decisions with urgency can be devastating for Pakistan's economy.

The detailed study of urbanization processes reinforces the higher growth of urban areas driven both by migration to urban centers but by high natural increase. Going deeper into the structural factors related to the economy, the authors of both Chapters 5 and 6 establish the dominant role of agriculture as the backbone of Pakistan's economy and a primary source of livelihood, while also presenting the challenge of absorbing the growing labor force. Migration is a major demographic process shaping Pakistan's population. The mobility of Pakistanis, particularly men, in search of livelihoods and remittances continues to contribute to household incomes across the country.

Migration is also driven by the inequities that make urban centers attractive for better services, especially in education and health. Furthermore, the growth of services and related jobs has absorbed a considerable portion of migrants into towns and cities. Undoubtedly, Pakistan will continue to urbanize, with a significant proportion—probably close to 50%—living in cities by 2050. Key questions regarding urbanization include when we can expect greater modernization and structural changes that lead to increased industrialization, which could alter attitudes and behaviors surrounding values of children and childbearing. Despite better access to health and family planning services, urban fertility remains high, though the TFR is almost one child lower than in rural areas.

International migration presents a slightly different phenomenon, as there are specific geographic pockets from which migration has occurred. Most recent migration trends are directed toward the Middle East and, to a lesser extent, Europe, with a more concentrated flow among educated men compared to uneducated laborers in the 1970s and 1980s. The perception is that this constitutes an exodus leading to brain drain. However, the numbers tmigrating abroad are not very high in terms of the large numbers of men and women in the labor force, and the offsetting influence of return migration has increased, particularly during the COVID-19 pandemic years. Also, while there is a clear demand for certain professional groups internationally, particularly due to aging populations in many European and East Asian societies, strict immigration laws hinder the free flow of workers from Pakistan.

The opening up of opportunities in international labor markets could accelerate international migration, which has not reached its peak in the past few decades. The stock of Pakistanis abroad remains at 9 million. The findings of Chapters 2, 3, and 4 emphasize the challenges and opportunities of an expanding labor force and the peak in the size of young entrants into the labor force. These could be sources of economic uplift. It is also widely expected that international

migration will alleviate job pressure and contribute to remittances, a major feature of Pakistan's economy in the past. However, this remains largely to be seen in the coming years. Pakistan faces a significant challenge in creating educational opportunities and matching skills within its labor force to compete with other countries seeking to fill similar labor gaps. Currently, this planning is largely inadequate.

Climate change and related crises are at the center of policy and private concerns in Pakistan, especially following the devastating floods of 2022. While mitigation and adaptation strategies acknowledge the importance of population trends and factors, there is limited substantiation about the pathways of influence. We are now better informed about the populations most affected, the dependence on agriculture for livelihoods, and the significant child dependency ratios that exacerbate climate impacts in rural areas of Pakistan.

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PART I

Population Dynamics and Projections

CHAPTER 2

Population Dynamics in Pakistan:

Fertility, Mortality, and Socio-Economic Development

Saima Bashir
Maqsood Sadiq
Wietze Lindeboom
Waqas Imran

Introduction

Population pressure remains one of the primary causes of declining per capita income, poor health and educational outcomes, high unemployment rates, inequality, and depletion of natural resources in poorer countries. There is broad consensus that better economic conditions—such as gainful employment and increased income—can influence population trends by shaping individuals' personal preferences, actions, and attitudes. These shifts in preferences and attitudes, in turn, contribute to improved economic outcomes through declining population growth rates and changes in population structure.

Since its inception, Pakistan's population has increased sevenfold, making it the 5th most populous country in the world, with an estimated population of 241.6 million in 2023 (PBS, 2023). Pakistan stands as an outlier in terms of population growth compared to its neighboring countries. The average population growth rate in South Asia (excluding Pakistan) is 1.0%. According to Pakistan's recent 7th Population and Housing Census (2023), the country's annual population growth rate is 2.55%—significantly higher than of India (1.2%) and Bangladesh (1.03%) (PBS, 2023).

Rapid and sustained population growth poses significant challenges to achieving social and economic progress, increasing the investment and effort required to ensure that no one is left behind. Consequently, per capita public expenditure must rise substantially to eradicate poverty, end hunger and malnutrition, and provide universal access to health care, education, and other essential services. As noted by the World Bank (2019), "Pakistan's high birthrate, the highest among neighboring countries, also threatens to overwhelm education and health services that are already overstretched."

Development Indicators for Pakistan in Comparative Perspective, 1990–2023

While most countries have taken the population-development nexus seriously, Pakistan's approach has been the least consistent. Several aspects of Pakistani society are considered obstacles to sustainable development, including its weak local governance, low status of women, early and widespread marriage, limited demand for and use of contraception, low levels of education and literacy, slow and unplanned urbanization, and lack of opportunities for upward social mobility.

Pakistan's social development indicators paint a bleak picture of the country's progress. In most of these indicators, Pakistan ranks at the bottom among South Asia nations (Table 2.1). However, the country has made relatively better progress in certain areas, such as increasing the numbers of births attended by skilled medical providers and consequently reducing the maternal mortality rate. Nonetheless, educational disparities persist, with far fewer women completing primary or higher education compared to men. In fact, the primary completion rate for females lags behind males by 10% (PBS, 2020).

Table 2.1. Socio-economic development indicators

Indicators	Pakistan	Bangladesh	India
Life expectancy at birth	65.4	72.4	67.2
Infant mortality rate (per 1,000 live births)	62.0	38.0	35.0
Under-five mortality rate (per 1,000 live births)	74.0	45.0	42.0
Maternal mortality rate (MMR) (per 100,000 live births)	186.0	215.0	143.0
Infant basic immunization (8 Dozes) (%)	65.6	89.1	76.5
Adult male literacy (%)	69.3	79.2	83.4
Adult female literacy (%)	46.5	72.8	69.1
% children underweight	23.1	21.9	32.1
% children stunted	37.6	23.6	35.5
% antenatal care (ANC) (At least 1 visit)	88.6	91.8	94.2
% Births by SBA	74.4	53.9	90.8
% Population with improved sanitation	81.2	65.5	77.8
Level of urbanization	38.0	40.5	36.4
Current health expenditure (% of GDP)	1.0	2.4	3.3
Government expenditure on education, total (% of GDP)	1.5	2.1	4.6

Sources: Demographic and Health Survey StatCompiler (2024); World Development Indicators (2024); Pakistan Maternal Mortality Survey (2019); Government of Pakistan (2024).

The poor state of development indicators in Pakistan reflects the government's underinvestment in social sectors. For example, public health expenditure was only 1.0 percent of GDP, and combined education expenditures by federal and provincial governments were estimated at 1.5% of GDP for fiscal year 2023 (Table 2.1). This level of investment is significantly lower than the internationally recommended norm. The Education 2030 Incheon Declaration, for instance, urges countries to

allocate at least 4–6 percent of GDP to education (UNESCO, 2015). Investing in education and healthcare is crucial for future productivity, as a healthy and educated population is more likely to contribute to economic growth.

The Human Development Index (HDI) provides insights into these issues. Pakistan ranks 164th out of 193 countries, with a HDI value of 0.540 for 2023/24, highlighting the country's challenges (UNDP, 2024). High population growth has undermined even the modest socio-economic gains Pakistan has made. The population projections for the coming decades (see Chapter 3 of this volume by KC et al., 2024) suggest daunting development challenges, both at the national and international levels.

Population dynamics, including fertility, mortality, and migration, have far-reaching implications for a country's socio-economic development and future trajectory. Policy development addressing the relationship between population and development requires a comprehensive understanding of these dynamics. The impact of population on development is multidimensional, and the relationship works in both directions.

A large youth population presents both opportunities and challenges. On the one hand, a relatively young population can drive accelerated economic development and prosperity on a per capita basis. On the other hand, if this youth population is poorly educated, lacks skills, and has limited employment opportunities, it becomes a burden on the country's economic development.

The main aims of this chapter are to:

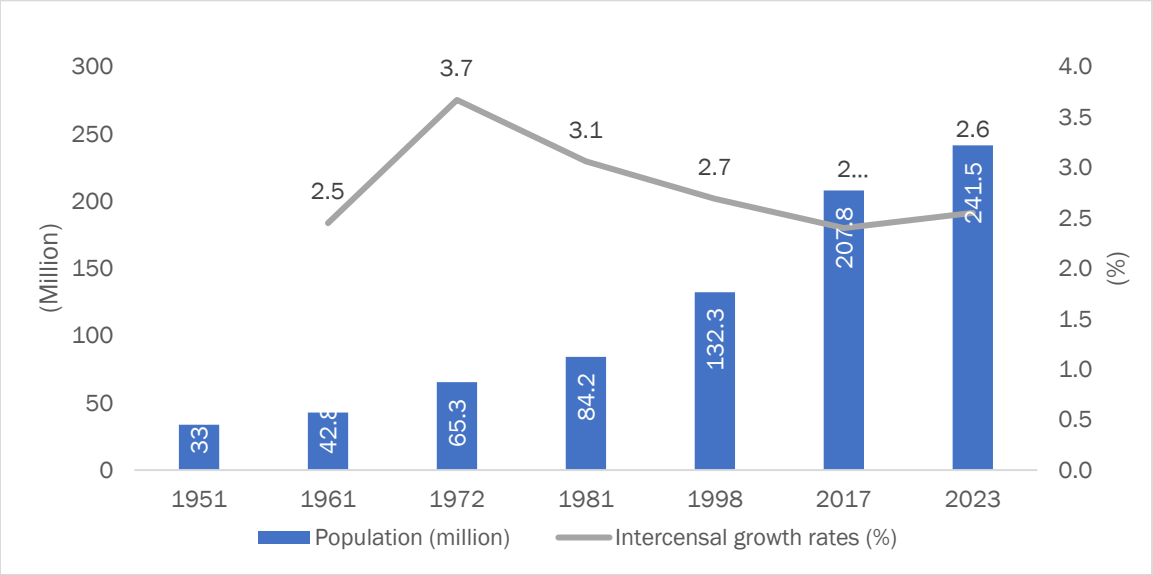
1. Review the demographic trends in Pakistan, examining all three components of population change—fertility, mortality, and migration—while highlighting provincial and rural-urban differences over time.
2. Analyze the reasons behind Pakistan's delayed demographic transition compared to other countries in the region.
3. Identify the policy implications of the connections between population dynamics and socio-economic development for future planning and decision-making.

Population Growth: Trends and Spatial Differentials

Population and Housing Censuses, typically conducted every ten years, are a primary source of estimating population size and growth. However, the irregular intervals between censuses in Pakistan have limited their effectiveness. Figure 2.1 presents the results of the seven censuses conducted in Pakistan since its establishment. The most recent 2023 census recorded a population of 241.49 million, with an average growth rate of 2.55% for the period 2017–2023—a rate that, contrary to expectations, is higher than the previous intercensal growth rates of 2.4% for 1998–2017 (Figure 2.1).

These census results indicate that earlier population projections underestimated the country's fertility and growth rates. The high average annual intercensal growth rate suggests strong population momentum, indicating that the population will continue to grow significantly in the future if current fertility trends persist.

Figure 2.1: Population (million) and intercensal growth rates (%) in Pakistan, 1951–2023



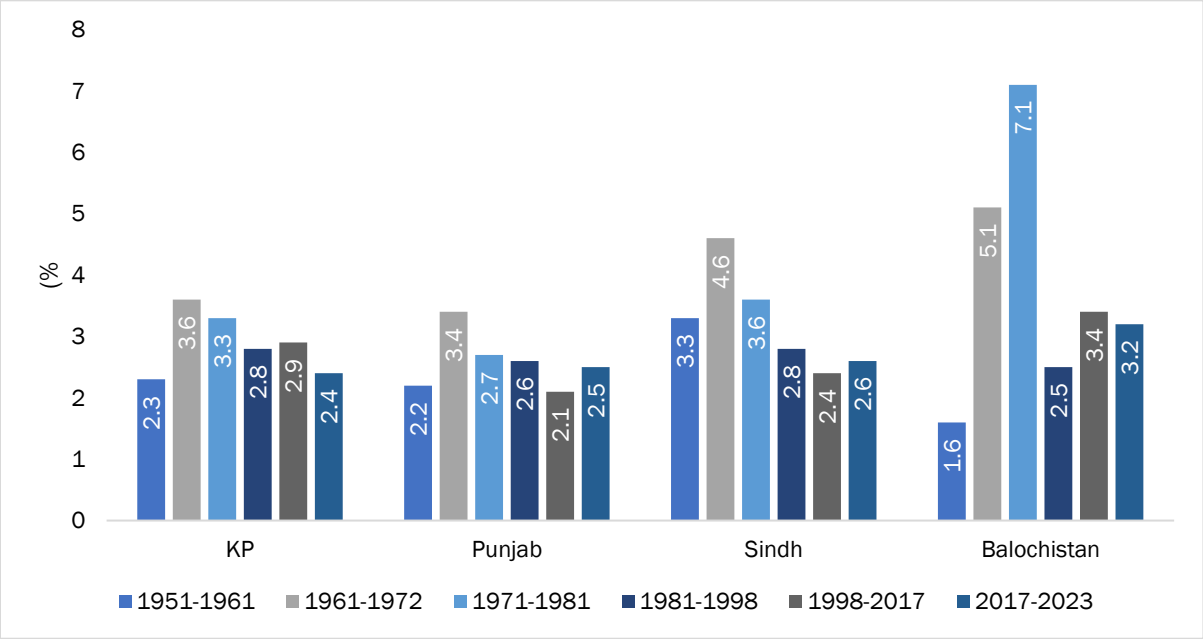
Source: Pakistan Bureau of Statistics, Population and Housing Censuses.

Despite Pakistan's early start with its family planning program in the 1960s, the pace of fertility decline has been slower compared to neighboring countries in the region. The recent census revealing a rapid population growth rate of 2.55% confirms that fertility rates have not decreased significantly, and Pakistan's fertility transition remains extremely slow. Although Pakistan experienced a rapid fertility decline during the 1990s—from 6.2 births per woman in the late 1980s to 4.8 births per woman in 2000–2001—raising expectations for a faster transition, these hopes were not realized. The subsequent decline in fertility from 4.1 to 3.6 births per woman took 11 years, leading to concerns that achieving replacement levels may be more challenging for Pakistan, one of the few countries with a population growth rate exceeding 1.5%.

Figure 2.2 illustrates the average population growth rates of Pakistan's four provinces, which vary based on their respective fertility levels and internal migration patterns. Balochistan recorded the highest population growth, followed by Sindh during the period 1951–1981. Karim (2018) suggested that the higher population growth in Balochistan could be attributed to improved census coverage or possible over-reporting. In contrast, Sindh's population growth has been driven by both natural increase and internal migration, primarily from Punjab and Khyber Pakhtunkhwa (KP) (Afzal, 2003; Karim 1986; 2018).

During the 1981–1998 period, Balochistan had the lowest annual growth rate among the four provinces, but from 1998–2017, the province once again reported the highest growth rate (Figure 2.2). As a result, the proportion of the provincial population in the total population has shifted over time; the proportion residing in Sindh and Balochistan has increased while Punjab's share in total population has declined.

Figure 2.2: Intercensal growth rate (%) at the provincial level for all censuses in Pakistan, 1951–2023



Source: Pakistan Bureau of Statistics, Population and Housing Censuses.

Spatial Distributional Impact of Population Growth

Pakistan's population is unevenly distributed, with the Punjab province accounting for more than half of the country's population. In contrast, Balochistan, the largest province geographically, is the least populated. The population is concentrated in agriculturally productive regions, particularly around the Indus River and its tributaries.

Globally, population distribution varies significantly depending on the scale or level of observation, and population density is commonly used to capture these variations. Population density relates the number of people to a specific area, making it a useful indicator. According to the 2023 census data, population density in Pakistan has steadily increased, from 42.4 people per square kilometer in 1951 to 303.4 people per square kilometer in 2023, driven by rapid population growth. The population density is highest in Islamabad, with 2,609.1 people per square kilometer, reflecting the growth of Federal Capital, followed by Punjab with 622 people per square kilometer. Balochistan has the lowest density, with 42.9 people per square kilometer (Census, 2023).

Since independence, Pakistan has experienced rapid population growth, which has also fueled internal migration. Migration is largely driven by population pressure, poverty, and spatial inequalities (for details see Chapter 5 of this volume by Arif, 2024). People tend to move from rural areas to urban centers in search of better life prospects, as urban areas offer more economic opportunities and are home to most of the service sector and knowledge-based economy (Stawarz & Sander; 2019; Florida 2017; Gans 2017; Geppert et al. 2008).

Urbanization in Pakistan, as defined in the population censuses, has increased from about 18% in 1951 to 38.8% in 2023 (Table 2.2). The average annual intercensal population growth rate of urban areas has declined significantly, from 4.9% during the 1951–1961 intercensal period to 3% during 1998–2017, but it rose again to 3.7% between 2017 and 2023. The gap between urban and rural population growth rates has gradually narrowed over time. After initially shrinking between 1951 and 1971, the pace of urbanization increased slightly during the 1971–1981 period, then slowed to its lowest level from 1998 to 2017, before returning to the 1971–1981 levels in the 2017–2023 period.

This recent increase in urban growth, marked by a 0.7 percentage point rise between 2017 and 2023, occurred during a period of political instability, lower GDP growth, high inflation, and COVID-19 pandemic-related reverse migration from urban to rural areas, making it more challenging to fully explain the rise in urbanization during this period.

Table 2.2: Census population, percent distribution, and intercensal average growth rates by urban-rural for all censuses in Pakistan, 1951–2023

Census year	Census population by region			
	(in thousands)		(percent distribution)	
	Rural	Urban	Rural	Urban
1951	27,754	5,986	82.3	17.7
1961	33,226	9,654	77.5	22.5
1972	48,715	16,594	74.6	25.4
1981	60,412	23,841	71.7	28.3
1998	89,316	43,036	67.5	32.5
2017	132,014	75,671	63.6	36.4
2023	147,749	93,751	61.2	38.8

Intercensal average growth rates by region		
Period	Growth rates	
	Rural	Urban
1951–1961	1.8	4.9
1961–1972	3.5	4.7
1971–1981	2.4	4.3
1981–1998	2.3	3.5
1998–2017	2.1	3.0
2017–2023	1.9	3.7

Source: Abbasi (1987); Arif and Ibrahim (1998); Arif et al. (2023); Pakistan Bureau of Statistics, 7th Population and Housing Census (2023).

Contrary to the common belief that internal migration (from rural to urban areas) is the primary driver of urbanization, natural increase (births minus deaths) has been the major contributor to urban growth in Pakistan. However, the impact of internal migration (rural to urban) and reclassification still plays a significant role, accounting for around 30% of urban growth (for more details, see Chapter 5 of this volume by Arif, 2024).

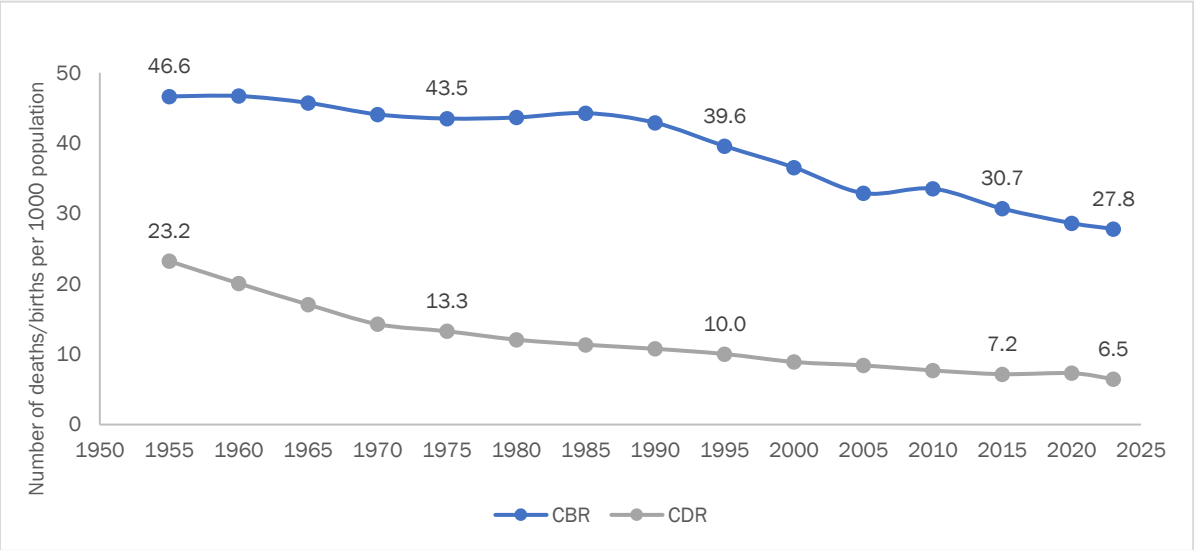
Demographic Transition and Population Growth

Population change is influenced by three main components: fertility, mortality, and migration. While Pakistan is undergoing a demographic transition, the process is unfolding at a slow pace. Both the crude birth rate (CBR) and crude death rate (CDR) have been declining over time, but the decrease in mortality rates has been more pronounced than the decline in fertility rates (Figure 2.3). The fertility

transition began in the last decade of the 20th century, but a plateau has been observed since 2005.

It is noteworthy that fertility decline started much later than the decline in mortality, which has contributed to higher population growth in Pakistan. While mortality rates showed a rapid decrease in the earlier years, they have recently stagnated. Interestingly, despite these changes, the gap between the CBR and CDR remains the same as it was 70 years ago.

Figure 2.3: Crude birth and death rates (deaths/births per 1,000 population) in Pakistan, 1955–2023



Source: United Nations, Department of Economic and Social Affairs, World Population Prospects (2024).

Mortality Transition

Mortality trends are important for understanding a country's health situation and for assessing progress toward achieving the Sustainable Development Goals (SDG). Life expectancy at birth is a key measure of overall mortality levels, as it remains unaffected by age structure, unlike the CDR. The decline in mortality in Pakistan has led to a substantial increase in life expectancy at birth, rising from 33 years to 70 years for females and from 36 years to 65 years for males between 1950 to 2023 (UN Population Prospects, 2024). Women have experienced greater gains in life expectancy compared to men, largely due to advancements in medical technology, access to life-saving drugs, and vaccinations, despite the country's overall low level of socio-economic development.

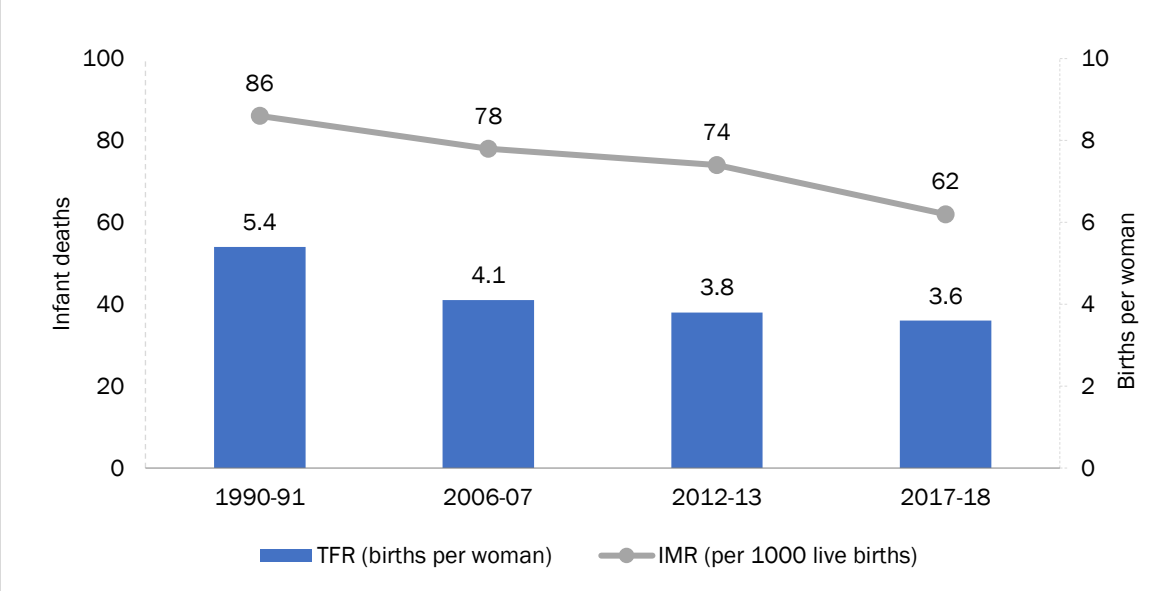
However, the overall improvements in CDR and life expectancy mask the persistent issue of high infant and under-five mortality rates. Pakistan has the highest infant and under-five mortality rates in the region, second only to Afghanistan. High child mortality is closely linked to fertility, as parents often adopt "hoarding" or "replacement" strategies to ensure that enough of their children survive. Despite efforts to improve child survival rates, infant mortality has only marginally decreased over the last 30 years, from 86 deaths per 1,000 live births in 1990–1991 to 62 deaths per 1,000 live

births in 2017–2018 (NIPS, 2018). Similarly, the under-five mortality rate remains at 74 per 1,000 live births.

Significant regional and socio-demographic variation exists in infant mortality rates (IMR). IMR is higher in rural areas, among children born to women with no formal education, younger mothers, and poorer households (NIPS, 2018). Maternal education is a crucial factor in reducing child mortality, as infants born to mothers with higher education have mortality rates that are nearly half of those born to mothers who have no formal education. This pattern holds true for neonatal and under-five mortality as well (NIPS, 2018).

Similarly, while Pakistan has significantly reduced the maternal mortality rate (MMR) over the years, there is still a long way to go. The MMR stands at 154 deaths per 100,000 live births in 2019 (PMMS, 2019).

Figure 2.4: Trends in Infant Mortality Rate (IMR) and Total Fertility Rate (TFR) in Pakistan, 1991–2018



Source: Pakistan Demographic and Health Surveys.

Stalled Fertility Transition and Low Contraceptive Prevalence Rate

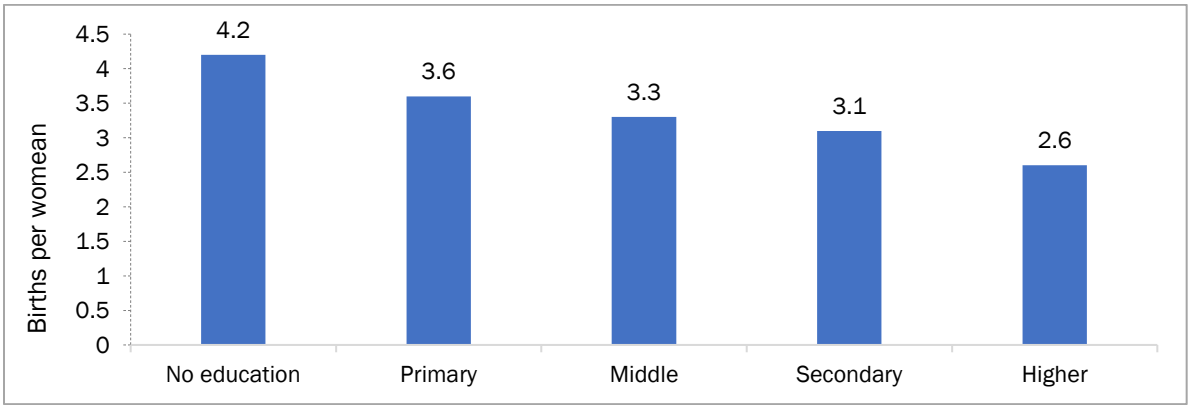
Despite initiating its family planning program in the 1960s, Pakistan's fertility transition continues to lag behind that of many Asian countries. Although the country experienced a rapid decline in fertility in the 1990s, raising high expectations of a catch-up effect, these hopes have not been realized. Recent analyses indicate that Pakistan's fertility transition is approaching a standstill, especially during its mid-transition phase (Bongaarts and Sathar, 2024), and shows no significant signs of decline despite improvement in female literacy—a key determinant of fertility reduction (NIPS, 2018). However, it is important to acknowledge that fertility stalls are not uncommon in developing

countries (Schoumaker, 2019), with similar patterns observed in many African nations during their transitions (Schoumaker, 2019; Bongaarts, 2008; Bongaarts and Sathar, 2024; Howse, 2015; Shapiro and Hinde, 2017).

Research highlights that fertility decline is influenced by multiple factors, including child mortality, slow urbanization, household wealth, and female education (Bongaarts and Casterline, 2013; Dreze and Murthi, 2001; Mahanta, 2016). Urbanization tends to reduce the demand for children due to higher cost of living in cities. Household wealth and income not only enables parents to raise more children but also facilitates greater investments in their health and education (Becker, 1981). Access to family planning services also plays a crucial role in enabling women to maintain birth spacing, which in turn enhances their ability to participate in the labor force (Karra al., 2022).

Among these factors, educational attainment—particularly female education—is most strongly associated with lower fertility levels. Education increases reproductive autonomy, delays marriage, and expands opportunities in the labor market (Cleland, 2009; Jejeebhoy, 1995; Kebede et al., 2022; Kravdal, 2002; Skirbekk, 2008; Lutz and Samir, 2011). In Pakistan, female literacy rates remain low at 53%, significantly below those of other countries in the region (PBS, 2023). Gender disparities in enrollment and literacy rates are pronounced (World Bank, 2022a; PBS, 2023)—with less than half of the women who have ever attended school (42%) completing primary or higher education, compared to 60% of men (PBS 2020; GoP, 2023). As mentioned earlier, women's education is closely linked to fertility decline, as seen in the fertility differentials by education level (Figure 2.5). The TFR decreases with an increase in a mother's education. Better-educated women have lower fertility rates compared to women with no formal education (NIPS, 2018). On average, mothers with no formal education or only primary education have 1.6 and 1 more children, respectively, than women with higher levels of education.

Figure 2.5: Total fertility rate differentials by women's level of education in Pakistan, 2018



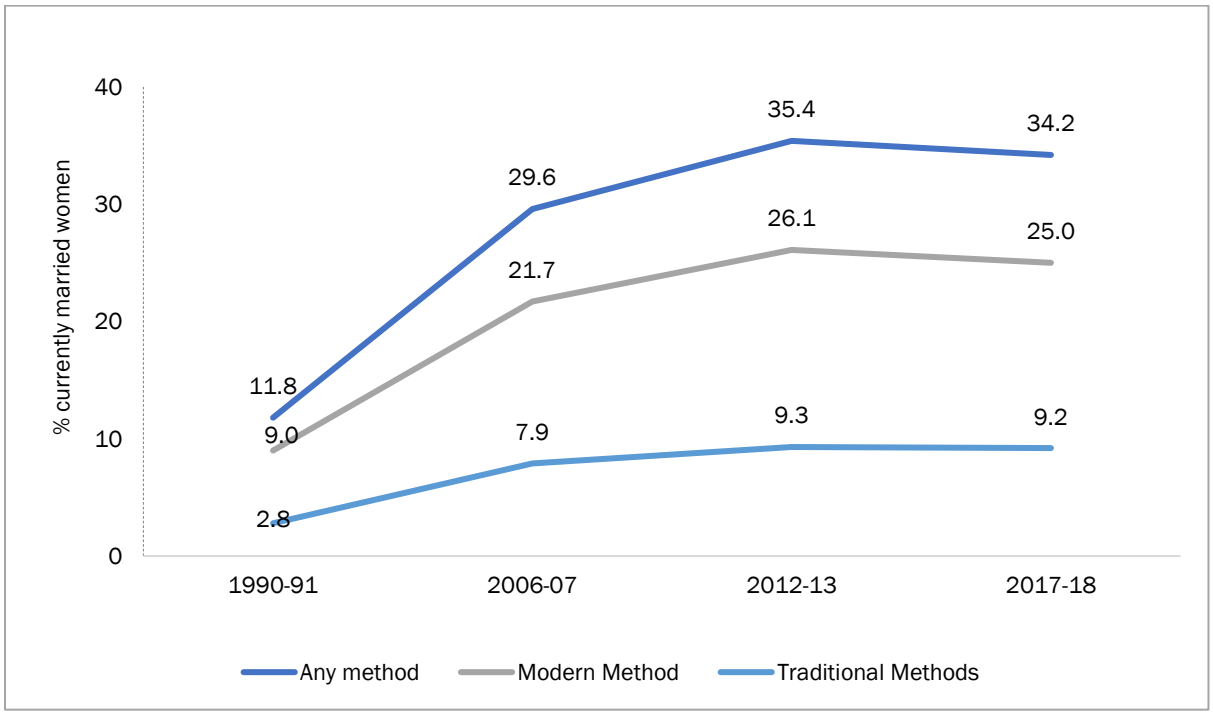
Source: Pakistan Demographic and Health Surveys (2017–2018).

Pakistan's performance in socio-economic indicators, especially female education and age at marriage, directly impacts reproductive attitudes and behaviors. High IMR, poor health outcomes, and low levels of education among women suppress the demand for family planning services. As a result, only about one-fourth of women in Pakistan use modern contraceptive methods, despite

nearly universal knowledge of family planning (NIPS, 2018). The unmet need for family planning is estimated at 17%, with 6.4 million women experiencing unplanned or unwanted pregnancies each year (Population Council, 2016).

The need for contraception is high among young couples. Bashir (2023) reported that nearly one-third of young women intend to use contraception but currently do not. This gap between knowledge of contraception and uptake contributes to unintended pregnancies. The share of unintended pregnancies ending in abortion increased from 30% in 1990–1994 to 61% in 2015–2019 (Guttmacher Institute, 2022). Preventing unplanned pregnancies and addressing the unmet need for family planning, particularly among young couples, could significantly reduce fertility rates and yield broader health, social, and economic benefits (Royan and Sathar, 2013). A faster decline appears achievable with the provision and expansion of family planning services to this key demographic.

Figure 2.6: Trends in use of family planning methods among currently married women aged 15-49 in Pakistan, 1991–2018



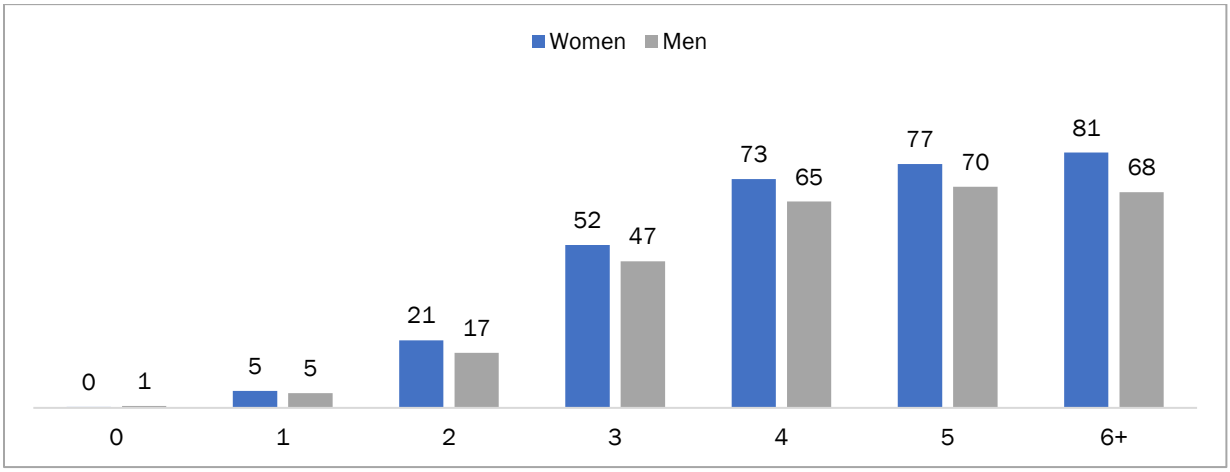
Source: Pakistan Demographic and Health Surveys.

Additionally, the desire for large families continues to drive population growth in Pakistan. The average ideal family size remains four children for both men and women, with a strong preference for sons. The early life course goals of childbearing across cohorts are surprisingly consistent. Notably, young men and women aged 15–24 also intend to have at least four children on average, indicating that early life course goals of childbearing are relatively stable and unchanged (NIPS, 2018).

High desired fertility is an important indicator of fertility intentions and behaviors. Therefore, examining desired fertility by the number of living children provides a clearer understanding of

couples' attitudes. Figure 2.7 clearly shows that at every parity level, a relatively small proportion of women and men in Pakistan wish to avoid having more children. For example, less than 50% of men and women with three living children reported wanting no more children.

Figure 2.7: Desire to limit childbearing by number of living children in Pakistan, 2017–18



Source: Pakistan Demographic and Health Surveys (2017–2018).

Migration

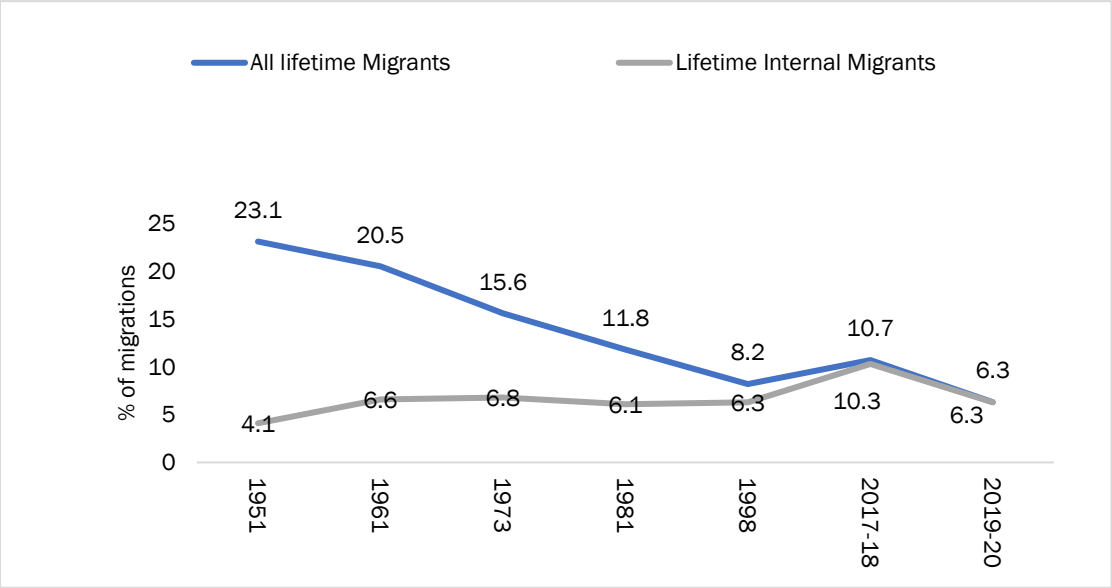
Internal Migration

Pakistan has a long history of population mobility both within the country (internal migration) and across its borders (international migration).

The rate of internal (lifetime) migration has remained between 6 to 10 percent since 1951. In the 1951 census, this rate was heavily influenced by the influx of Muslim immigrants from India at the time of Independence. Excluding these immigrants, the incidence of lifetime internal migration was less than 5% in 1951 (Figure 2.8).

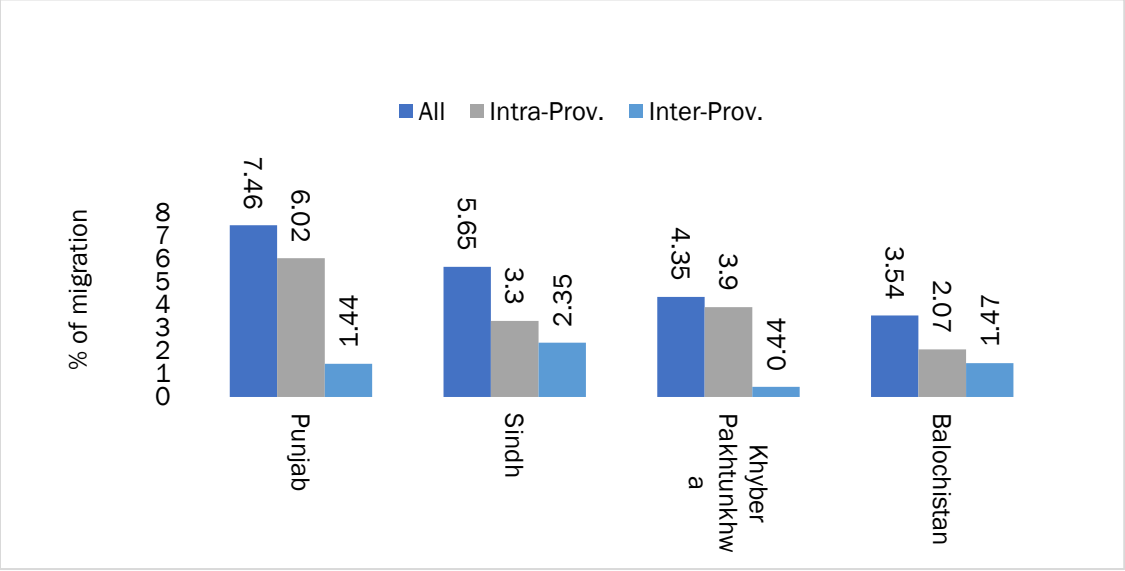
The extent of internal migration varies across provinces, and districts. Figure 2.9 shows province-wise data on internal migration from the 2019–2020 Pakistan Social and Living Standards Measurement (PSLM) Survey, which reports only inter-district movements. The highest incidence of internal migration is reported in Punjab (7.5%), followed by Sindh (5.7%), KP (4.4%), and Balochistan (3.5%). In Punjab and KP, migration is primarily intra-province while Sindh and Balochistan attract significant numbers of migrants from other provinces, with 42% of their migrants originating from other provinces. Nationally, internal migration is largely within provinces, but this pattern varies by district. Although only 6% of the population is counted as migrants (inter-district) at the national level, in 10 districts of the country, this share ranges from 10 to 19 percent. These districts are typically provincial capitals or industrial hubs with high levels of urbanization.

Figure 2.8: Life-time migration in Pakistan, 1951–2020



Source: Pakistan Bureau of Statistics, Pakistan Social and Living Standards Measurement Survey (2019–2020); Pakistan Demographic and Health Surveys (2017–2018).

Figure 2.9: Internal (lifetime) with intra-province and inter-province migration shares



Source: Pakistan Bureau of Statistics, Pakistan Social and Living Standards Measurement Survey (2019–2020); Pakistan Demographic and Health Surveys (2017–2018).

Overseas Migration

At present, the stock of overseas Pakistanis, or the Pakistani diaspora, is estimated to be around 9 million, with more than half residing in the Middle East, over a quarter (2.4 million) in Europe, and 12% (1 million) in North America (BEOE). Other regions where Pakistanis have settled permanently or living on temporary visas/permits are Africa, Australia, and New Zealand. Much of Pakistan's

international migration is directed towards Gulf states and in the form of contract labor, characterized as circular migration, as these countries do not offer citizenship to the migrants. Consequently, while migration to Gulf states may not permanently affect demographic trends, it can lower fertility rates due to the prolonged absence of male migrants.

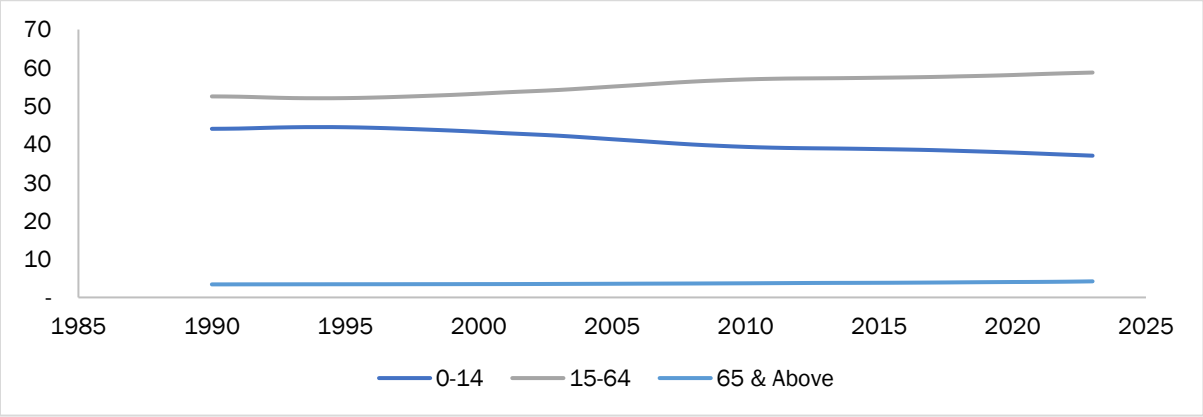
Overseas migration has significantly improved the socio-economic status of families back home by funding education, health, and entrepreneurial ventures. Districts with high rates of emigration have also experienced beneficial spillover effects from remittances on the local economy, particularly on construction, real estate, and the rural economy (agriculture and non-farm activities). Between 2006 and 2009, districts with higher emigration rates showed improved living standards, as reflected by lower scores on the multidimensional poverty index (Farooq and Arif, 2023).

Structure of the Population

Slow Demographic Transition and Changes in Age Composition

Pakistan's slow fertility transition has gradually altered the country's age structure, leading to a decrease in the proportion of the young population from 43% in 1990 to 35% in 2020, along with a corresponding increase in the working-age population (Figure 2.10). When a country's age structure has a larger share of the working-age population (15–64 years), it offers the potential for economic gains, a phenomenon known as the demographic dividend. After 2000, Pakistan's age distribution began to shift noticeably, with around 67% of the population now under the age of 30. However, the actual numbers tell a more complex story, with the elderly population (65 and above) totaling 8.5 million and the youth population (aged 15–29) comprising 26% of the total population, with slightly more males than females.

Figure 2.10: Percentage share of different age groups in Pakistan, 1990–2023

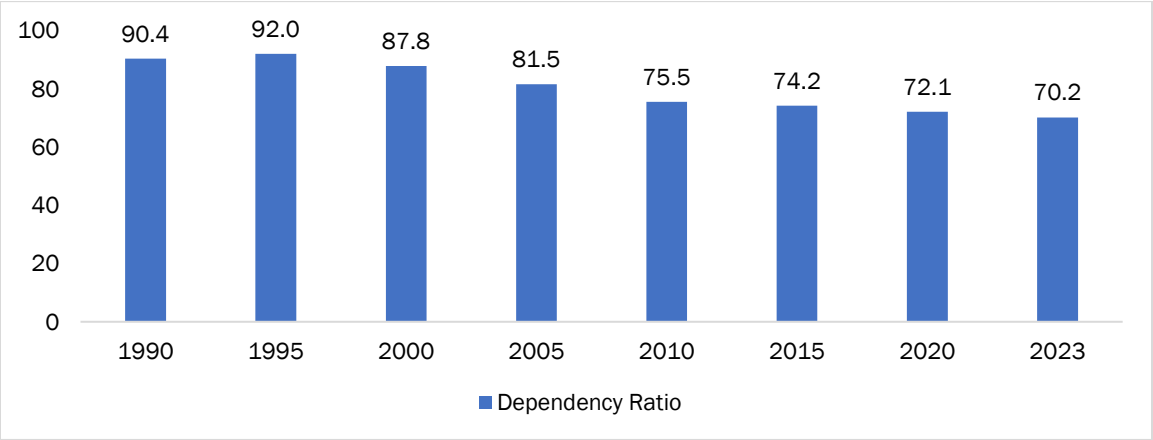


Source: United Nations, Department of Economic and Social Affairs, World Population Prospects (2024).

The evolving age structure has helped reduce the dependency ratio from 90.4 in 1990 to 70.2 by 2023 (Figure 2.11). However, the child dependency ratio remains the primary contributor to the overall higher dependency ratio. Despite the overall decline in the proportion of children since 2000, Pakistan has yet to fully leverage the benefits of its growing working-age population due to

inadequate investment in human capital, education, health, and skills development of youth. Nearly 40% of children under five suffer from stunted growth, which affects their cognitive development and lowers productivity in adulthood (Mansuri and Hyder, 2023). Additionally, only a quarter of women participate in the labor force, primarily in agriculture or low-paying jobs (PBS, 2021), leading to low overall productivity.

Figure 2.11: Trends in Age Dependency Ratio* in Pakistan, 1990–2023



*Age dependency ratio is the ratio of dependents (people younger than 15 or older than 64) to the working-age population (ages 15–64).

Source: Authors' calculation using data from United Nations, Department of Economic and Social Affairs, World Population Prospects (2024), Online Edition.

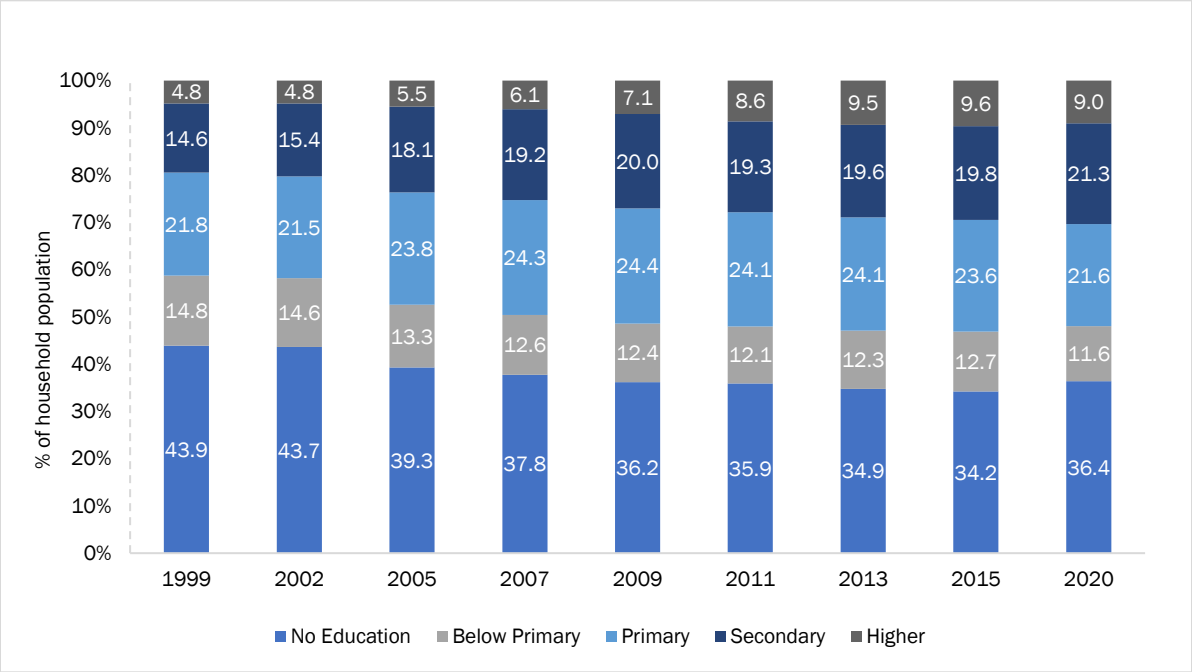
Education

Investing in human capital—education, health, and skills development—enhances individuals' productivity and future earning potential (Patrinos, 2019). Changes in population dynamics have significant implications for this investment. Improvements in life expectancy and the expectation of higher returns on education encourage parents to invest more in their children's education. Educated and skilled populations earn premium wages, contribute to greater workforce productivity, and improve living standards. However, to provide quality education, particularly at higher levels, the burden on the education system must be eased by lowering fertility rates.

Changes in childbearing behavior have an immediate impact on the school-aged population. It is important to note that education indicators in Pakistan are not promising. For instance, nearly 40% of the population aged 10 years and above has no formal education. The literacy rate among females is fifteen percentage points lower than that of their male counterparts (PBS, 2023).

Figure 2.12 illustrates the educational attainment levels of the population aged 15 and above. While there has been a decline in the proportion of the adult population with no formal education, nearly two-fifths of the adult population still lacks formal education. Similarly, the attainment level for primary education has declined and remains almost the same as it was in 1999. However, there has been an increase in population with secondary and higher levels of education over the same period.

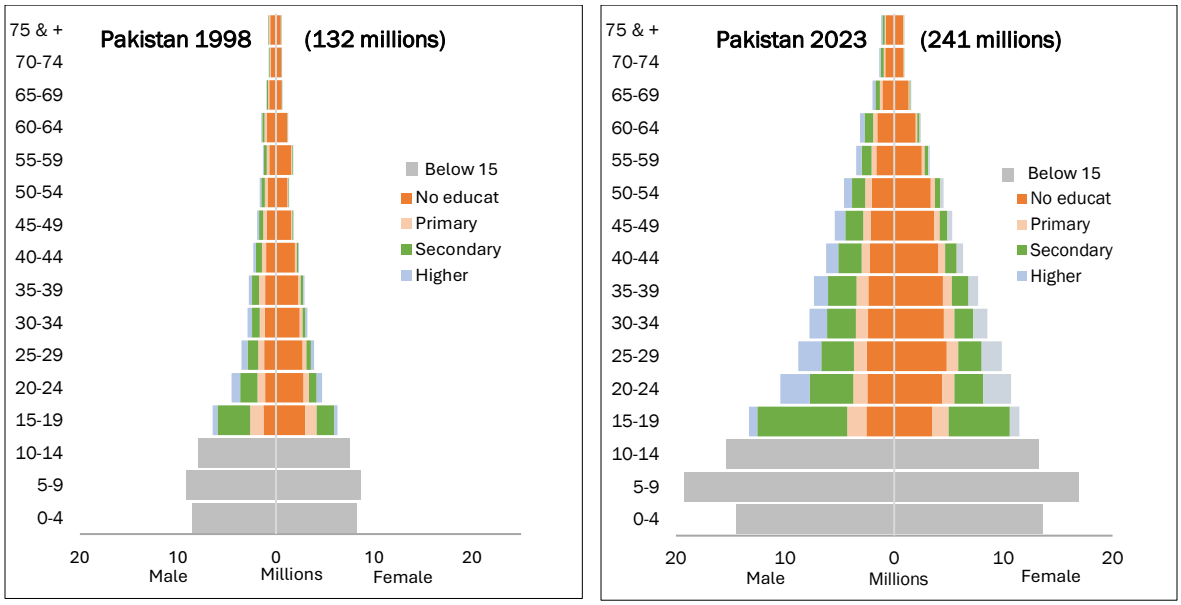
Figure 2.12: Educational attainment by level for age 15 and above in Pakistan, 1999–2020



Source: Pakistan Bureau of Statistics, Government of Pakistan, Pakistan Integrated Household Survey (PIHS) 1998–99, and Pakistan Social and Living Standards Measurement Survey (PSLMS), various surveys.

Women, in particular, face stark educational disadvantages compared to men, with a significant gap in educational attainment across all levels of education (Figure 2.13). The majority of women (56%) have never attended school, and this situation has changed little over time. As of 2020, nearly half of women still have no formal education. Only a small very select group of women have had the opportunity to attend secondary and higher educational institutions. However, there are signs of hope, as the younger cohort of women is better educated than their older counterparts.

Figure 2.13: Age-sex and educational pyramid in Pakistan, 1998 and 2023



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Pakistan Integrated Household Survey (PIHS) 1998-99, Pakistan Social and Living Standards Measurement Survey (PSLMS) 2019-20, and population data from census 1998 & 2023

The slow fertility transition, coupled with persistent high population growth, poses a significant barrier to allocating sufficient resources for investments in human capital, particularly in education. Despite improvements in enrollment rates at all levels of education, especially at the primary level, Pakistan is experiencing a rising demand from parents for the education of both boys and girls. Although there are debates regarding the number of children out of school,[6] there have been clear improvements in enrollment rates for both boy and girls. The primary net enrollment ratio, which reflects the extent to which the next generation is being enrolled in educational institutions, is increasing rapidly. However, this increase is still not sufficient to keep pace with the growing number of children who need schooling.

The large number of out-of-school children highlights a gap between the demand for and supply of education, which contributes to Pakistan's low enrollment rates compared to neighboring countries like Bangladesh and Nepal that are much closer to achieving universal primary education (UPE). Encouragingly, girls aged 10–15 are showing rapid improvements in primary completion trends—but they still have much lower primary completion rates than boys.

To fully capitalize on the changing age structure, Pakistan must invest in ensuring that all school-age children are enrolled in school. As Nayab (2008) noted, "just by having the school-going population in the 'right' proportion does not make the demographic benefits automatic." In response, the Government of Pakistan has recently declared an education emergency, aiming to achieve universal enrollment (UPE) by 2028 by bringing all out-of-school children into schools. Achieving UPE is

[6] According to the 2023 Population and Housing Census, around 36 percent (26 million) children aged 5–16 years are out of school nationally.

essential for building Pakistan's human capital in the coming decades. A key focus must be on girls' education to ensure they do not fall behind. As Goujon and Wazir (2011) observed, "this low fertility level of tertiary-educated women means that, despite the relatively few women with tertiary education, the opportunities of higher education act as a disincentive to 'investing' in having many children."

Labor Force

Based on data from labor force surveys, between 2010–2011 and 2020–2021, Pakistan's working-age population (15 years and over) increased by 31.5 million, translating to an addition of over 3 million people joining the labor force each year (Table 2.3). This rapid growth poses a significant challenge for the labor market to absorb the expanding workforce.

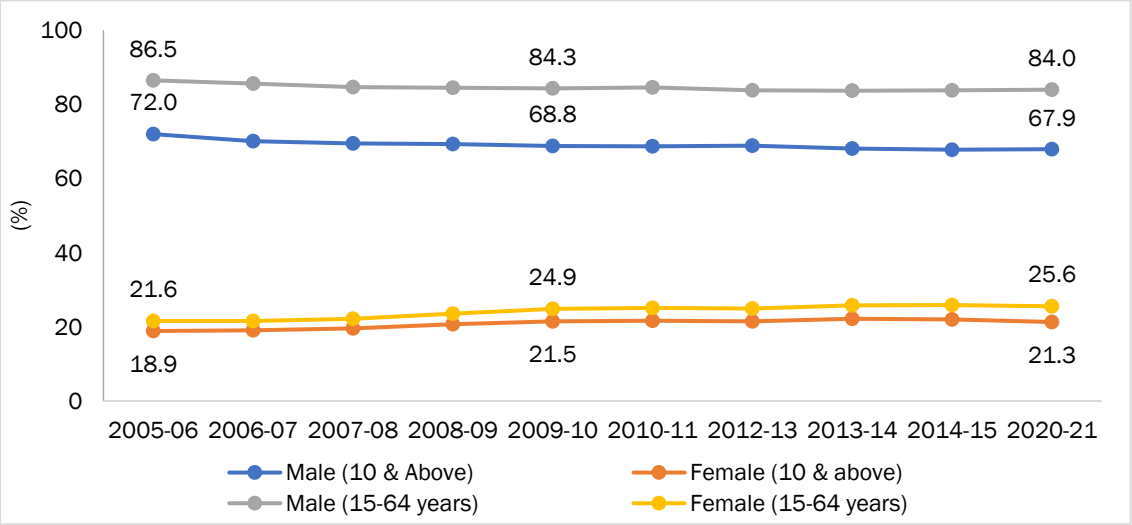
Table 2.3: Working-age population aged 15 and above, 2010–2011 and 2020–2021

	Period	Male	Female	Total
Working-age population (15 +)	2020–21	67,072,174	66,440,928	133,513,101
	2010–11	51,494,454	50,511,054	102,005,508

Source: PBS (2020-2021).

A key aspect of the demographic transition is the increase in female labor force participation. However, in Pakistan, female participation remains consistently low, with only one-quarter of the working age women active in the labor market (Figure 2.14). As Nayab (2018) noted, "the benefits of the demographic dividend cannot be reaped with half the population not fully active in the labor market as is prevalent in Pakistan." The total labor force participation rate remains stagnant at around 55%, primarily due to low female participation. While most male members of the workforce are employed, most female members are not. This distinguishes Pakistan from many other countries. Without greater engagement from women in the workforce, Pakistan will struggle to realize the full benefits of its demographic dividend that can transform the country's society and economy.

Figure 2.14: The working-age population and labor force participation of males and females, 2005–2020



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Labour Force Survey (LFS) data series (various issues).

Improving female education is crucial for boosting overall economic growth and reducing fertility rates. Educated women tend to marry later, have fewer children, and are more likely to enter the formal labor market, contributing to the economy (Canning and Schultz, 2012; Musaddiq and Said, 2023). As female education levels rise, more women will seek meaningful employment, necessitating adjustments in the economic sector to accommodate this growing workforce. As Courbage et al. (2016) aptly noted, "the economic sector and unemployment will have to adjust to an ineluctably booming active population, rather than the other way around."

Sectoral Composition of Workers

The informal sector accounts for a large portion of Pakistan's employed population, accounting for 46%, and the agriculture sector employs nearly 37% of the labor force. A notable gender disparity exists, as approximately 70% of female workers are engaged in agriculture, primarily as unpaid family workers. In contrast, the formal (non-agriculture) sector represents only 17.8% of total employment, with the majority of workers involved in informal (non-agriculture) work. Women are twice as likely to work in the informal sector compared to the formal sector (PBS, 2021).

Table 2.4: Sectoral composition by gender, employed male and female, aged 15–64

Sector	Male	Female	Total
Agriculture	27.5	67.5	36.6
Formal	19.6	11.4	17.8
Informal	52.9	21.1	45.7
Total	100	100	100

Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Labour Force Survey (LFS) 2020-2021.

In addition to the availability of employment opportunities, which impacts both sexes, women and girls in Pakistan face far more social and cultural challenges when they choose to work. These challenges often restrict them to certain sectors deemed "appropriate" for women (Kamran et al., 2018). Women working in the service and industrial sectors face societal constraints, as these roles typically require them to leave their homes and work alongside men. Although there has been a slight increase in women's employment in the services industry, men continue to dominate this sector, with most women still concentrated in agriculture-related work.

Household Income/Poverty

Ending poverty in all its forms and dimensions by 2030 is the first goal of the SDGs. A study by the Pakistan Institute of Development Economics (PIDE) found that poverty declined from 61.6% in 1998–1999 to 21.5% in 2018–2019 (Haque et al., 2021). However, poverty levels have recently increased due to the economic impact of the Covid-19 pandemic and rising inflation. According to a recent World Bank study, 40% of Pakistanis now live below the poverty line (Barriga-Cabanillas et al., 2024; World Bank, 2024). There are significant rural-urban and provincial variations in poverty rates, with a more pronounced decline observed in urban areas compared to rural ones.

During the period from 1998–1999, urban poverty declined from 47.4% to 10.7%, while rural poverty decreased from 67.5% to 27.6%. Factors such as higher fertility in rural areas (particularly in the poorest households), limited access to healthcare and education, and a lack of non-agricultural employment opportunities contribute to the persistence of higher poverty in these regions. Provincial data reveal that while poverty has declined across all provinces over the past two decades, on average, poverty remains highest in Balochistan and lowest in Punjab. In 2018–2019, poverty rates were estimated at 16.3% in Punjab, 24.6% in Sindh, 27% in KP, and 40.7% in Baluchistan (Haque et al., 2021).

Conclusion

Pakistan's economic and social development challenges have been exacerbated by the continued rapid growth of its population. Pakistan's population has increased sevenfold since independence, rising from 33 million in 1947 to 241 million in 2023, making it an outlier in terms of population growth among its neighboring countries.

Pakistan is undergoing a demographic transition, albeit slowly. While the mortality rate has steadily declined, the corresponding drop in fertility has not followed at the same pace (Sathar et al., 2013). The fertility rate has decreased over the last 75 years from six births per woman to four births per woman in 2006. The TFR has remained stagnant at around four births per women since 2006 and shows notable differences across education and income groups (Royan and Sathar, 2013).

While the size of the population is integral to a country's dynamics, the structure also holds important implications for policy formulation across all sectors. Pakistan's population structure has undergone a significant shift, with around 67% of its population now under the age of 30, and the share of the youthful population aged 15–29 reaching 26%. A large working-age population resulting from demographic transition promises economic gains and development for the country.

However, rapid population growth has put immense pressure on the country's infrastructure and resources, eroding any gains made in socio-economic development. Declining fertility rates and lower population growth can provide an impetus for development by freeing up resources that can be redirected to develop human and physical capital (Nayab et al., 2019).

Population dynamics are integral to the country's overall socio-economic development. Analyzing and understanding trends in population dynamics helps policymakers formulate evidence-based policies. The following lessons can be drawn from the analysis of population dynamics carried out in this chapter.

1. **Provincial population trends.** Pakistan's population has grown significantly since 1951, with Punjab being the most populous province, followed by Sindh. Punjab houses more than half of the country's inhabitants, but its share has consistently declined over the years—from 60.9% in the 1951 census to 52.9% in the Digital Census 2023. The decline in Punjab's share can be attributed to relatively higher population growth in Sindh and Balochistan. Sindh's population share increased from 17.9% to 23.1%, while Balochistan's grew from 3.5% to 6.2%. The Digital Census 2023 reports the highest population growth rate in Balochistan, while Khyber Pakhtunkhwa experienced slower population growth. Rapid population growth has driven urban expansion, resulting in challenges such as overcrowding, inadequate infrastructure, and strained resources. The uneven population distribution highlights socioeconomic disparities, as urban centers attract migrants seeking better opportunities, creating a complex demographic landscape that poses both challenges and opportunities for sustainable development.
2. **Fertility transition and youth workforce.** The ongoing fertility transition, albeit slow, has led to a change in the population's age structure, with a large segment of the working-age population entering the labor market. Educating and employing this young population is the

biggest challenge. Low secondary enrollment and completion rates, when compared to neighboring nations, pose significant barriers to development. Advancing towards a knowledge- and skills-based economy without educational advancements will be extremely difficult.

3. **Women's empowerment.** Despite some advancements in women's health, education, nutrition, economic opportunities, and political participation over the past few decades, women in Pakistan still lag significantly behind men. Prevailing socio-cultural norms and high fertility expectations are major obstacles to women's empowerment. Pakistan's socio-economic development will largely depend on educating the next generation of workers, especially women, and finding meaningful employment opportunities for them.

4. **Economic potential of youth.** The reduction in the dependency ratio brought about by a high proportion of the working-age population offers hope for rising per capita income. However, the promise of economic prosperity will remain a pipe dream unless high quality education and skill development are provided, along with ample and meaningful employment opportunities. If youth do not enter the labor force due to a lack of such opportunities, the potential for a demographic dividend is lost. "There is a need to realize that the dividend is not automatic and has to be reaped" (Nayab et al., 2019).

The state must focus on investing in human capital and creating jobs, particularly for women and young people. To empower, educate, and employ young people, overlapping investments are needed to fully realize the demographic dividend. Women's empowerment is central to achieving this dividend. Therefore, formulating and implementing policies that eliminate all types of discrimination and violence against women are crucial for advancing gender equality, women's employment, and social protection.

In conclusion, a comprehensive and integrated approach, involving provincial and diverse stakeholders, is essential for the formulation of effective population and development policy and for ensuring its successful implementation. A strategic focus on reducing the population growth rate is a key enabler for accelerating human development and achieving the Sustainable Development Goals.

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CHAPTER 3

Population @ 2050: Projections and Implications for Sustainable Development

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Introduction

Population and development are interrelated yet complex concepts. The relationship between population dynamics and development is multi-dimensional, with each influencing the other. Certain aspects of the population, such as a favorable age structure, can contribute significantly to economic development. However, a large population with limited human capital can hinder a country's economic growth. Education and training are vital for enhancing the productivity of the labor force (Nayab, 2008).

Until recently, demographers have focused only on the age and sex structure of society to understand population behavior, often overlooking other important individual and community characteristics that contribute to diverse fertility behaviors. For example, population projections have typically been based on age and sex composition, as these factors have significant implications for reproductive preferences and related socio-economic dimensions. Distinct patterns of fertility, mortality, and migration are closely linked to the population's age and gender composition. For instance, age composition plays a critical role in socio-economic planning, as the demands and needs of various age groups differ. The younger age group requires education and health services, the young adult population (ages 15–29) has implications for the labor market, and the elderly have unique health and retirement needs.

However, there is a growing recognition among demographers that other characteristics, beyond age and gender, also significantly influence behavior. These characteristics include factors such as place of residence, education, migration, employment status, and income group, among others. Demography as a scientific discipline has a comprehensive and effective set of tools for analyzing population dynamics, enabling it to create detailed population projections based on various assumptions about future trends in fertility, mortality, migration, and other factors influencing population changes (Samir and Lutz, 2017).

Human Capital and Fertility Transition

Human capital encompasses both the health and educational capital of the population. These indicators are essential in assessing the productivity potential of individuals during adulthood. In this

chapter, we focus primarily on the educational aspect of human capital due to its strong association with fertility dynamics and the increasing emphasis on incorporating educational attainment into demographic modelling and population projections.

Research has consistently shown that education is one of the most influential factors affecting reproductive attitudes and behaviors, contributing to variations in fertility and mortality across different groups (Kebede et al., 2019; Bongaarts and Casterline, 2013). Studies on fertility transitions have highlighted the strong impact of education, particularly female education, on reproductive attitudes and behaviors (Musaddiq and Said, 2023; Büttner et al., 2023). Educated women are more likely to marry later, have greater awareness of family planning methods, prioritize the human capital of their children, possess more decision-making power, and face a higher opportunity cost of having more children compared to their less-educated counterparts (Bongaarts, 2010). Moreover, educated parents tend to have a higher life expectancy, and their children have a greater likelihood of survival. The impact of education on fertility is most pronounced in societies with higher fertility rates (Skirbekk, 2008; Lutz and KC, 2011).

Future changes in the distribution of women by educational attainment will significantly affect reproduction rates due to the strong correlation between female education and fertility. Lutz and KC (2011) have demonstrated that—even when assuming similar levels of fertility and mortality specific to education—merely considering alternative educational scenarios could result in a difference of nearly one billion people in global population estimates for 2050. Additionally, changes in the educational composition of the population have far-reaching implications for a country's socio-economic development (Lutz et al., 2008).

State of Education Outcomes

Despite visible demographic changes that should favor rapid economic growth, progress in human capital indicators in Pakistan remains slow. The country's ambition to become an upper-middle-income country by 2047 is hampered by the inadequate pace of human capital development, limiting its ability to fully benefit from its demographic dividend (World Bank, 2019). Among the key determinants of human capital development, the provision of quality education is a critical enabler.

Article 25-A, introduced under the 18th Constitutional Amendment, mandates the state to provide free and compulsory education to children aged 5–16 years. However, the state of education indicators in Pakistan is not promising. Two-fifths of the population aged 10 and above has no formal education. Among the 60% of the population that has ever attended school, the completion rates for primary, lower secondary, and upper secondary education are 67%, 47%, and 23% respectively (PSLM, 2019-20; Pakistan Economic Survey, 2022–2023). The youth literacy rate (ages 15–24) is 68% (PBS, 2024), and less than one-fourth of young people have completed upper secondary education (USAID, 2022).

Gender inequality is deeply rooted in education and employment in Pakistan. Although females make up 49% of the population, about 53% of women aged 15–64 have never attended school, compared to only 33% of males in the same age group. Primary school for girls is 56%, compared to 67% for boys. The gender gap widens at the secondary school level, where enrollment is 19% for girls and 25% for boys, indicating a higher dropout rate among girls at this stage. Less than half of the women

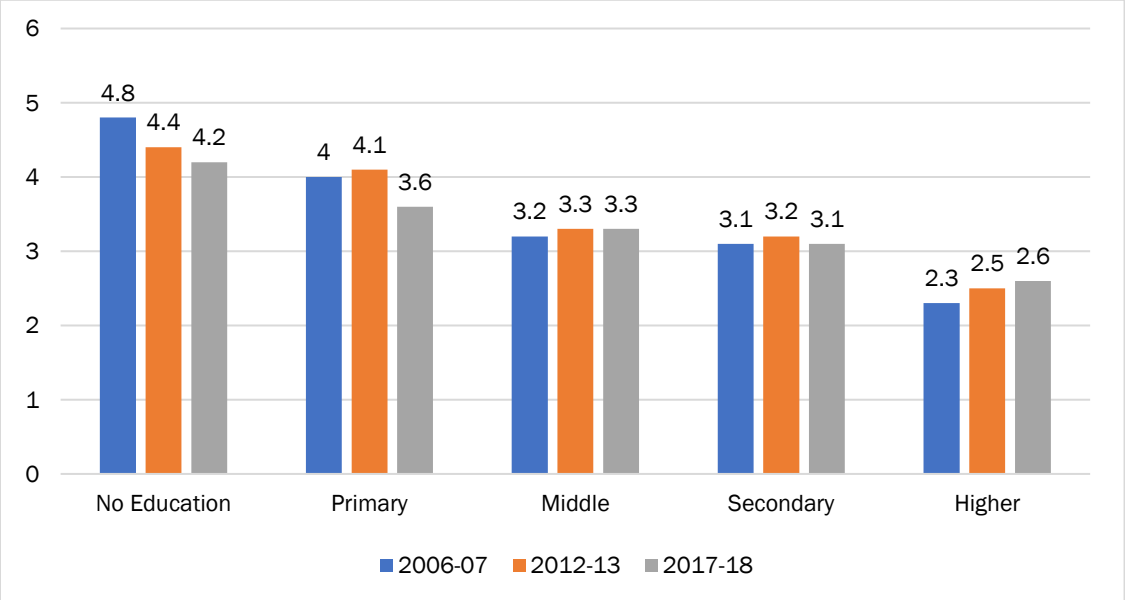
who have ever attended school (42%) have completed primary or higher education, as compared to 60% of men (PSLM 2019-20; Pakistan Economic Survey, 2022-23). Moreover, about 60% of young women (ages 15–29) years) are not in engaged in education or employment, highlighting the severe lack of learning and economic opportunities (Haque & Nayab, 2022).

Only a very small, select group of women have the opportunity to attend secondary and higher educational institutions. Although gender disparities in educational attainment remain stark, younger cohorts of women are increasingly better educated.

Female Education and Fertility

As discussed, women's education is associated with fertility decline, as evidenced by the differences in fertility rates among women with varying education levels (NIPS, 2018). Fertility has declined more rapidly among women with no formal education or only primary education, while it has stabilized among those with middle and above education levels. There is a slight increase in the total fertility rate among women with higher education, but, overall, better-educated women have lower fertility rates compared to their counterparts with no formal education (Figure 3.1). On average, in 2017–2018, mothers with no formal education had 1.6 more children, and those with only primary education had one more child compared to women with higher levels of education.

Figure 3.1: Trends in total fertility rate by women's education: 2006-2018



Source: Various Pakistan Demographic and Health Surveys.

Both the education levels of wives and husbands contribute to reducing fertility. Studies indicate that households in which wives are more educated than their husbands tend to have fewer births (Dreze & Murthi, 2001; Godefroy, 2018; Musaddiq and Said, 2023). However, fertility decisions are also influenced by several other factors shaping reproductive attitude and behavior. For instance, the relationship between income and population shows that as family income increases, fertility tends to decrease as families prioritize quality over quantity in child-rearing. Other factors influencing the

balance between fertility and investment in human capital include child survival rate, preference for male children, and the perceived returns on educational investment.

Objectives

High population growth and poor human capital continue to strain Pakistan's development and resources. The country can only reap the benefit of a demographic dividend if human capital formation, particularly among youth, becomes a priority in policymaking and planning. Investment in education and skill-building is key for rapid economic growth and prosperity. Similarly, education—particularly female education—is a prerequisite to fertility decline. Goujon and Wazir (2011) observed that the low fertility rate among women with tertiary education indicates that the opportunities associated with higher education can discourage women from having large families, even though a relatively small proportion of women have attained tertiary education.

The primary objective of this chapter is to project Pakistan's population in the context of its present and future human capital. This involves integrating educational attainment as an important source of heterogeneity in population projections models to provide a comprehensive outlook of the country's population, human capital, and development trajectory.

The chapter presents the results of population projections under two scenarios: Business as Usual (BaU) and Council of Common Interest (CCI), which were developed to explore potential demographic futures for Pakistan and their implications. In addition, this chapter discusses the policy implications of population dynamics for the education sector and labor market, aiming to guide future policy and planning efforts over the coming decades.

Population projections give a picture of a population's future size and age-sex composition, based on assumptions regarding historical trends related to fertility, mortality, and migration. Multiple projections are considered to account for various possible scenarios and their impact on future levels of fertility and mortality. Population size and structure differ under various scenarios and assumptions for each component of the population. Although these assumptions are based on past trends and expert opinions, they are uncertain and subject to change.

Data and Methods

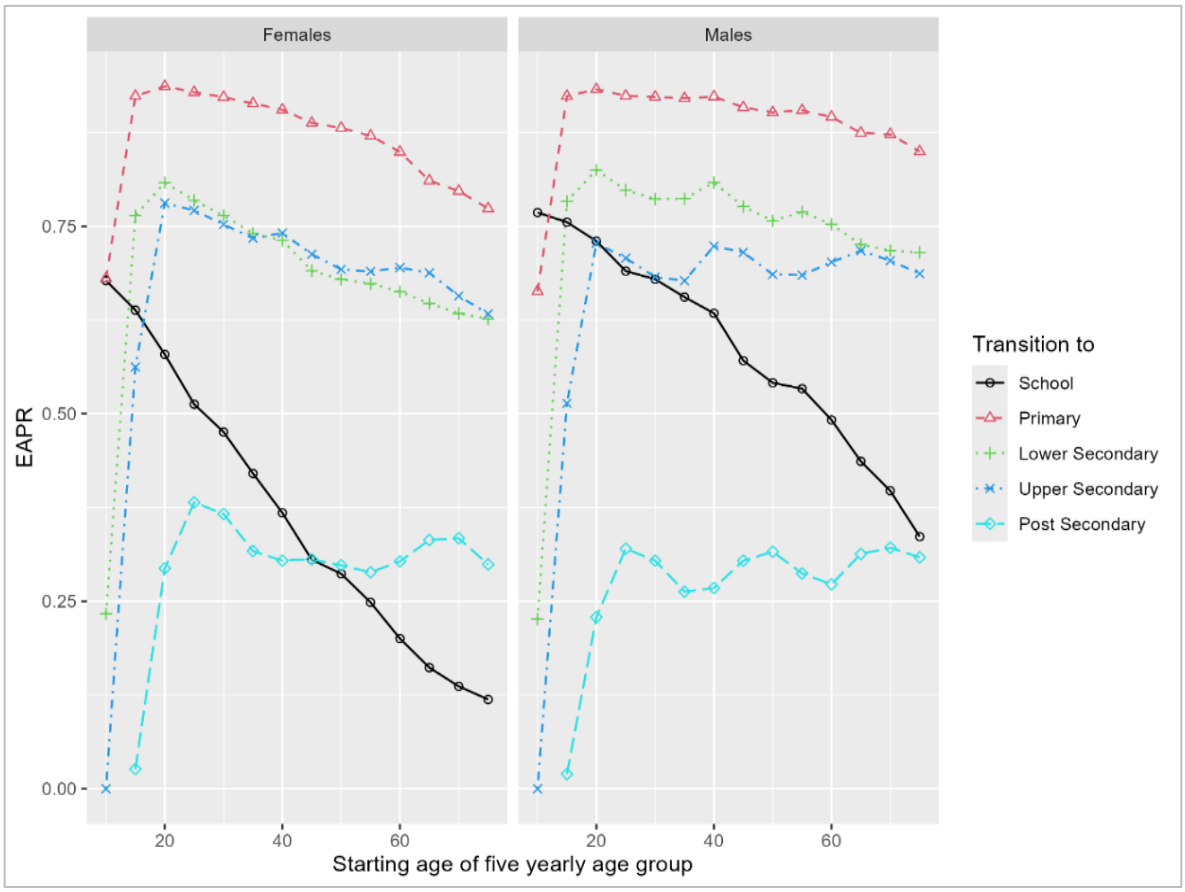
Data

To develop a multi-dimensional population projection model that includes fertility, mortality, and education, this study distinguishes six levels of educational attainment: 1) no education, 2) below primary, 3) primary completed, 4) lower secondary complete, 5) upper secondary, and 6) post-secondary completed.

The base year for the projection is 2023, with a total population of 240,458,089, based on data from the 2023 Census (PBS, 2023), which provides the population in five-year age groups, with the last open-ended age group being 70 years and more. The Pakistan Bureau of Statistics reports a total population of 241,499,431, but detailed age-sex distribution is available only for 240,458,089. The discrepancy is due to the exclusion of restricted areas and collective households, where only headcounts were provided.

To extend the age group to 100+ for the projection, we applied the age distribution data from the UN's World Population Prospects (WPP) for 2023 to the year 2024. We found that the UN's estimate for 2023 (as of January 1) was 5.6 million higher than reported in the Census 2023 report. Population structure by age, sex, and educational attainment in Pakistan is discussed in Chapter 2 of this volume (Bashir et al., 2024). Figure 3.2 illustrates the trend in the educational attainment progression ratio (EAPR) by sex in Pakistan, based on 2017 census data. The transition to school for the cohort aged 15–19 is relatively lower for females compared to males. However, the EAPRs indicate that females generally have slightly higher transition rates at higher and post-secondary levels.

Figure 3.2: Trend in educational attainment progression ratio (EAPR) by sex, 2017



Source: Pakistan Bureau of Statistics, 6th Population and Housing Censuses 2017.

Model

We developed a multi-dimensional population projection model for Pakistan, by age, sex, and educational attainment. The model includes five-year age groups (0–4, 5–9, ..., 100+), two sexes, and six categories of educational attainment. The projection begins in 2023 and advances in five-year increments until 2050.

The Wittgenstein Centre (WIC) model employs an extended cohort component approach, with the population's initial distribution categorized into 252 distinct states, taking into account transitions between these states:

- **Children under 15 years:** Classified into three age groups, two sexes, and six "mother's education" groups (36 states). For cohorts under 15 years, data is not available by "mother's education" in the initial time 2020.
- **Adults aged 15 years and above:** Organized into 17 five-year age groups plus a 100+ age group, two sexes, and six educational categories (216 states).

The model tracks four key components of population change: fertility, mortality, migration, and educational attainment. Key transitions include:

1. **Aging:** Over time, individuals progress to the next age group. Some exit their current state (alive with a specific education) due to mortality. By the end of each 5-year projection interval, the age groups (e.g., 0–4, 5–9, ..., 100+) shift to the next categories (5–9, 10–14, ..., 105+). Survivors in the oldest age group (105+) are combined with those aged 100–104 to form a new 100+ group.
2. **Educational transitions:** The size of the state may change due to education-related transitions at specific ages. We assume that all educational transitions cease once the cohort reaches the age of 30–34. Specifically, transitions to primary education will be completed by ages 15–19, lower secondary by 20–24, upper secondary by 25–29, and post-secondary by 30–34.
3. **Migration:** Emigration decreases the size of the population, while immigration increases it.
4. **Reproduction:** Women give birth, and newborns replenish the population in the youngest age group, 0–4 years old. We employ fertility rates as the final component, ensuring that migration's impact on fertility is accounted for. Some newborns will not survive, while those who do during the projection period are grouped by their mother's education level, which remains the same until they reach age 15, experiencing differential mortality rates accordingly.

In this model, all the transitions are determined by the level of educational attainment.

Assumptions for Projections

Our primary scenario is the WIC's Shared Socioeconomic Pathways medium scenario (SSP2), with adjustments to the age-specific fertility rate (ASFR) patterns, as detailed in the scenario section. Below, we outline alternative narratives for Pakistan to generate potential futures with some modifications to the base scenario. These scenarios are generated by combining different variations of the four components of population change.

Narratives for Fertility

Lowering the fertility rate remained the key goal, supported by family planning services and initiatives focused on women's health, education, social development, and legal empowerment. In

2018, the Chief Justice of Pakistan deemed the country's high population growth unsustainable in a Suo Moto notice. A task force was established to develop a strategy for addressing this issue, resulting in eight key recommendations aimed at accelerating efforts to increase the contraceptive prevalence rate (CPR) and reduce the total fertility rate (TFR) (Population Council, 2018) (Table 3.1).

These recommendations were subsequently reviewed and endorsed by the Council of Common Interest (CCI), the country's highest inter-provincial decisionmaking body, in November 2018. This endorsement made the recommendations legal, creating a roadmap for all stakeholders, primarily public sector entities, to work together toward achieving these objectives.

Table 3.1: Council of Common Interest (CCI) targets

Indicators	2025	2030
TFR (CCI)	2.8	2.2
CPR (CCI)	50%	60%

However, CCI's targets were very ambitious, and current estimates indicate that there has been little progress. As of 2024, the TFR stands at 3.36 children per woman (UNPD, 2024), reflecting an annual decline of only 0.04 children since 2018. Given the slow pace of fertility decline and the minimal increase in the CPR, we present two scenarios for fertility decline in this analysis.

1. **Business as Usual (BaU):** In the first scenario, it is assumed that recent trends in fertility decline will continue, with Pakistan's TFR expected to reach 2.5 by 2048–2053 (Table 3.2).
2. **Accelerated decline (CCI-based):** The second scenario (Table 3.2) envisions a more ambitious pace of fertility decline, aligned with the CCI's goals (Table 3.1), targeting a reduction of 0.08 children per year—doubling the current rate of decline (BaU scenario). Under this scenario, the TFR would eventually decline to 2.0 by 2048–2053 and stabilize at that level. Achieving this accelerated decline, however, will require significant investments in education and family planning initiatives.

Table 3.2: Narratives for total fertility rate

Scenarios	2023–2028	2033–2038	2043–2048	2048–2053
Business as Usual (BaU)	3.43	3.06	2.69	2.50
Council of Common Interest (CCI)	3.13	2.15	2.05	2.00

Narratives for Education

The Education Trend (ET) scenario assumes that the current sex-specific trends in educational enrollment and attainment rates will continue, with a mild improvement in overall educational attainment. Our analysis found only minor differences between Pakistan's ET scenario and WIC's Global Education Trend (GET) scenarios (KC et al., 2024).

In addition, a Policy Stimulus (PS) scenario envisions that Pakistan will achieve universal primary enrollment during the 2028–2033 projection period among children aged 5 to 9, corresponding to the cohort born between 2023 and 2028. This scenario assumes a rapid expansion in education, driven by the Government of Pakistan's recent declaration of an education emergency. The aim is to bring all out-of-school children into schools, achieving universal enrollment by 2030. For the rest of the educational transitions, we follow the GET scenarios.

Narratives for Mortality

We follow WIC's narratives for mortality (KC et al., 2024), applying education-specific survival ratios from their recent updates. Survival ratios were available for the periods 2020–2024, 2025–2029, and so on. We used simple interpolation to calculate ratios for the period 2023–2028 through 2048–2053, with March 1 as the reference point, corresponding to the end of the 2023 Census.

Scenarios

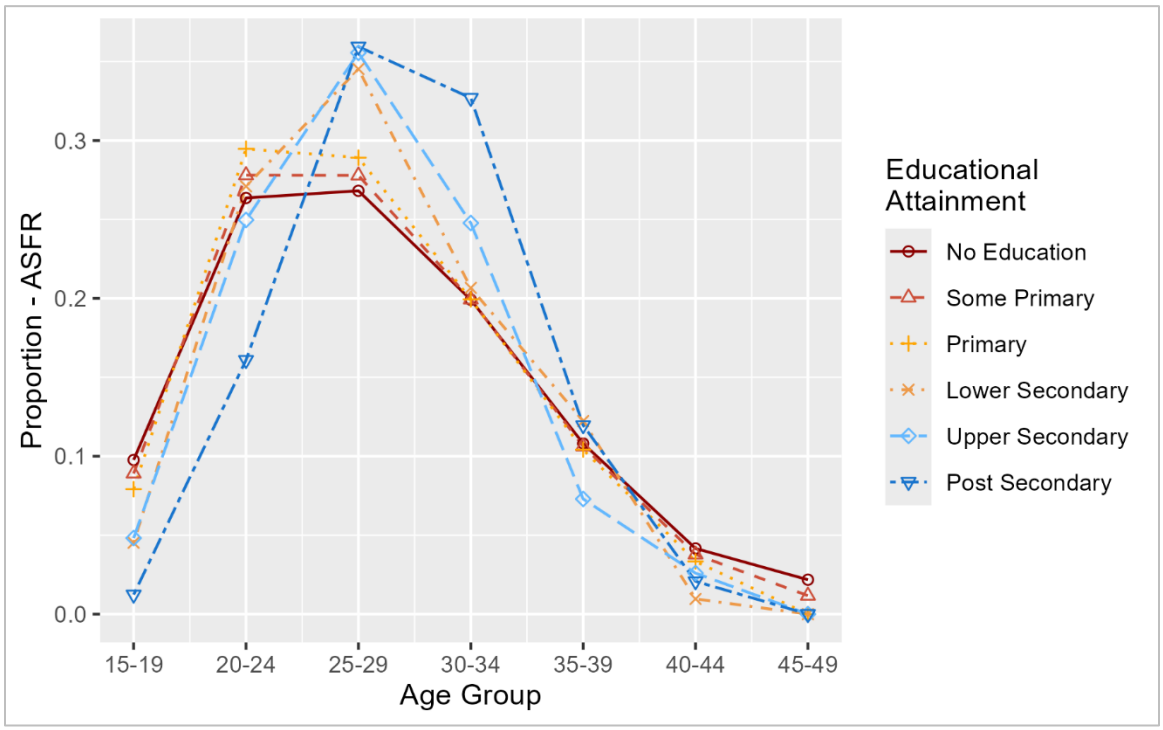
Using the narratives described, we applied the multi-dimensional demographic model to run two future scenarios (Table 3.3).

Table 3.3: Variants for the model components of change for two scenarios

Scenario	Fertility	Mortality	Education	International Migration
Business as Usual (BaU)	Business as Usual	Wittgenstein Center's Pakistan (WIC-P)	Education Trend with Policy Stimulus for school entrance (ET-PS)	Net Zero by age, sex, and education (Net0)
Council of Common Interest (CCI)	Fast decline (CCI)	WIC-P	ET-PS	net0

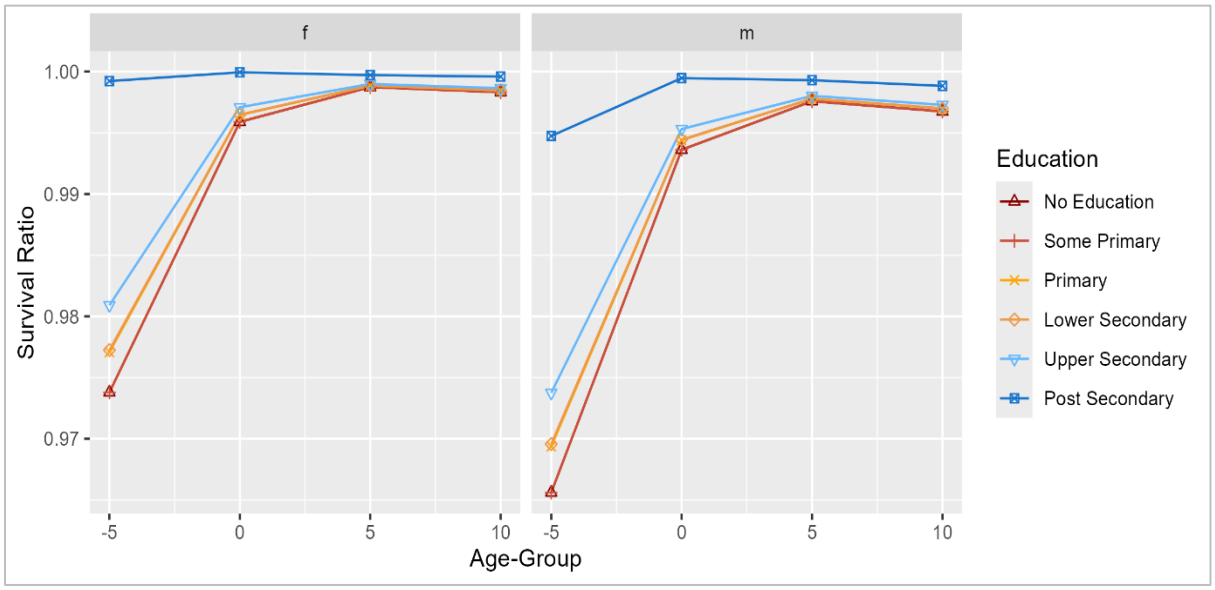
The sex ratio at birth was taken from the UN projection (1.055) and held constant until 2052. Education-specific ASFR patterns were derived from the Pakistan Demographic and Health Survey (PDHS) 2017–2018 (Figure 3.3) and applied to education-specific TFRs in the projections. These patterns indicate that more educated women tend to have children later and at lower levels. We proportionally adjusted the education-specific ASFRs to align with the overall TFR scenario.

Figure3 3: Education-specific ASFRs in Pakistan from DHS, 2017–2018



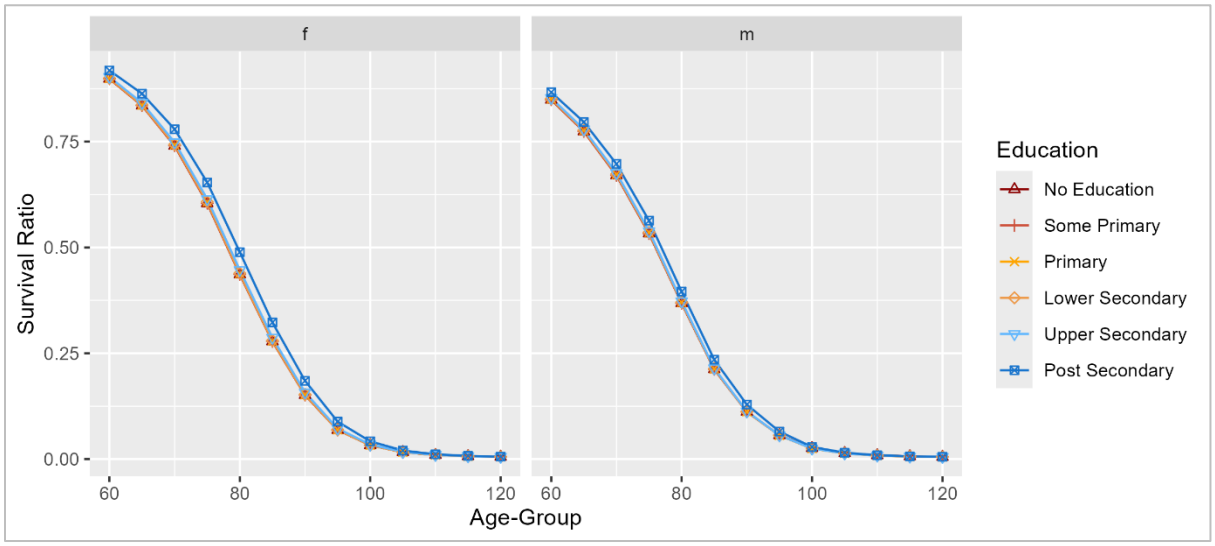
Education-specific survival ratios from the WIC projection are used for all scenarios. Figure 3.4 shows the survival ratios by mother's education, applied to the children under 15 years. After this, the child's own education is used to determine their mortality experience (Figure 3.5).

Figure 3.4: Mother's education-specific survival ratio (2020–2024) by child's sex



Source: Samir et al., 2017.

Figure 3.5: Education-specific survival ratio (2020-2024) among Pakistan's 60+ population



Source: Samir et al., 2017.

Migration Scenario

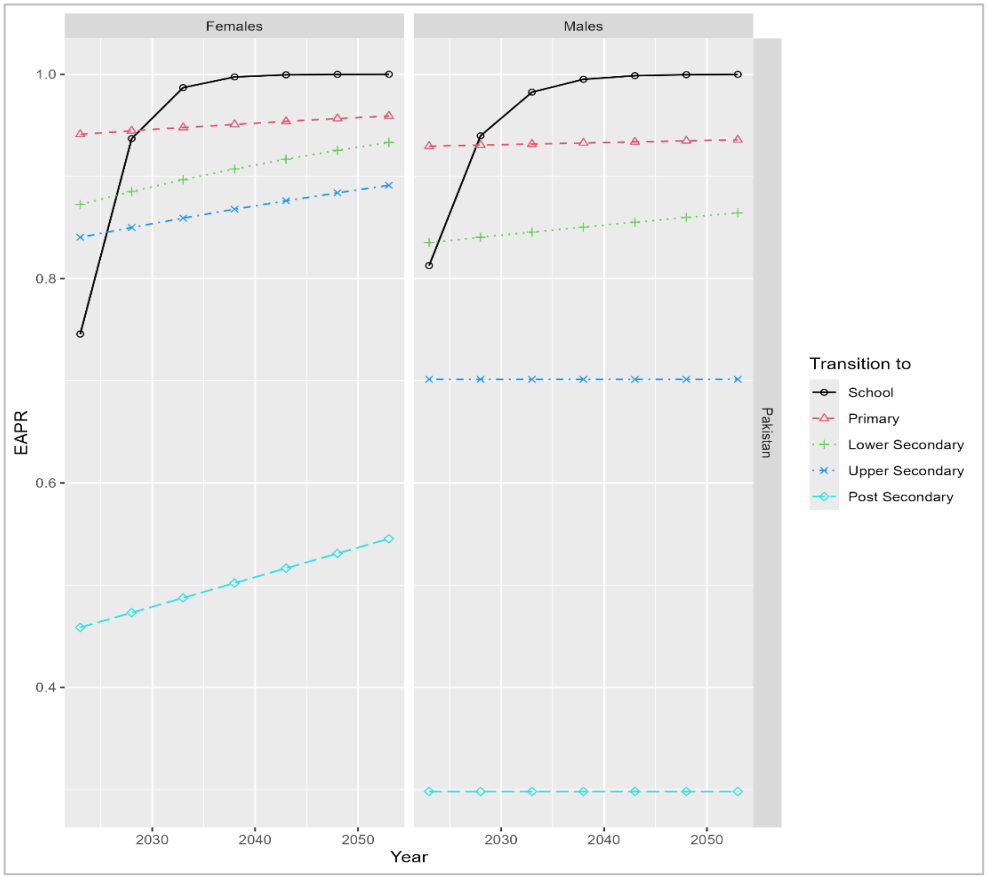
We assume zero migration in our projections. As noted in Chapter 2 of this volume (Bashir et al., 2024), much of the international migration in Pakistan involves contract labor to the Gulf States, where workers are required to return home once their contracts expire. This type of circular migration does not lead to permanent settlement, as these countries do not offer citizenship to migrants. Furthermore, Pakistan is not a significant destination for immigrants. Therefore, we assume zero net international migration for this projection.

Education Scenario

Figure 3.6 shows the ET scenario for Pakistan, which extrapolates the EAPRs by sex at the education-specific ultimate age for the period 2023–2053. The first transition (e12) from entering school to completing primary (e23) is expected to occur by age 15–19. The ultimate ages for transitions to lower secondary (e34), upper secondary (e45), and post-secondary (e56) education are assumed to be 20, 25, and 30, respectively.

In 2023, the transition rates to schools for the cohort aged 15–19 were lower for females than males. EAPRs indicate differences between sexes, with females generally having higher transition rates except for post-secondary transitions.

Figure 3.6: Trend extrapolation of the EAPRs, except school entrance following policy stimulus scenario, by sex for Pakistan at ultimate age for an educational transition, 2023–2053



Business as Usual (BaU) Scenario

In the BaU fertility scenario, we apply a slow fertility decline, as outlined in Table 3.2 and Table 3.3. Following this trajectory, Pakistan's TFR is expected to decrease by 0.04 children per woman per year, reaching 2.50 by 2048–2053. We started with initial estimates of education-specific ASFRs at the national level and proportionally adjusted births (by age and education) to align with the projected TFR. This scenario is combined with the Education Trend with Policy Stimulus (ETPS) scenario.

CCI Scenario

In the CCI scenario, we replace the BaU fertility trajectory with a faster decline, doubling the current rate (Table 3.2). Under this scenario, Pakistan's TFR level is expected to decrease by 0.08 children per woman per year, reach replacement level by 2033–2038, and eventually stabilize at 2.0 by the end of the projection period.

Results

Total Population

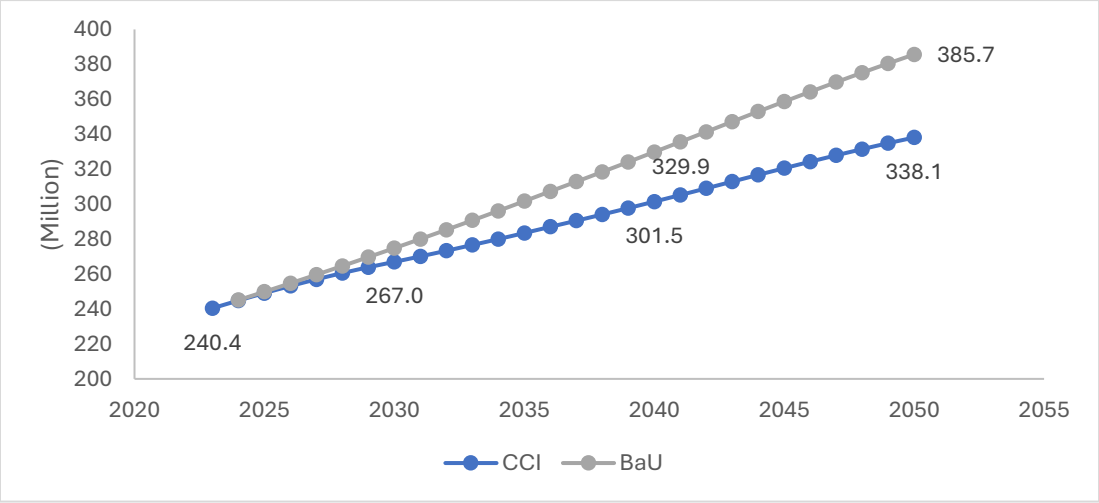
Age-Sex Distribution of 2023 Population

As noted, the base year population by age and sex is derived from the 2023 Population and Housing Census (see Figure 3.8). The age-sex structure of the 2023 population resembles a classic pyramid with a broad base, indicative of high fertility. Approximately 41% of the population is under 15 years of age, while only 4% are elderly (65+ years). The share of the youthful population aged 15–29 is 26%, with a slightly higher proportion of males than females. Over the next 27 years, until the middle of this century (the projection horizon), the size and structure of this population will undergo dramatic changes due to the combined influences of fertility, mortality, and the inherent population momentum.

Total Projected Population of Pakistan Under Two Scenarios: 2023–2050

Figure 3.7 presents the projected population of Pakistan from 2023–2050 under two scenarios discussed earlier. In the BaU scenario, the population is expected to reach 386 million by 2050—a 60% increase from the current population. This rise is primarily driven by a high natural increase; for every death during the 2023–2028 period, there are expected to be approximately 4.31 births (Table A1; Appendix A). This natural change ratio will initially increase before gradually declining 3.56 by the end of the projection period.

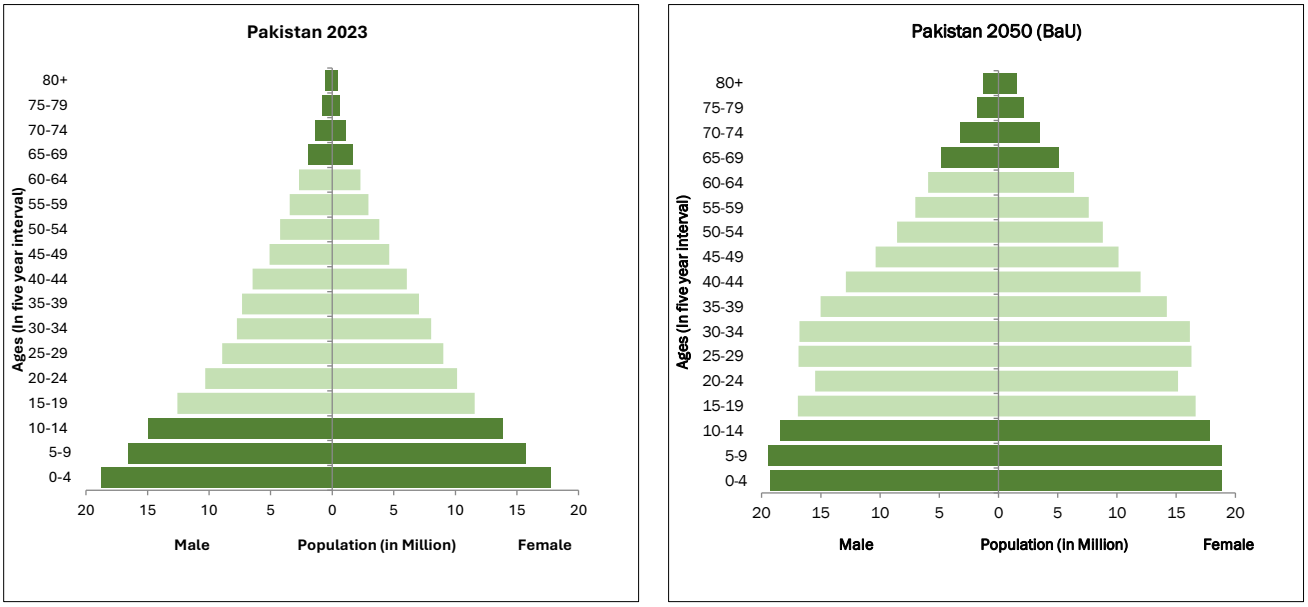
Figure 3.7: Total projected population of Pakistan under BaU and CCI Scenarios



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Population and Housing Census 2023 data as a base for population projection under different fertility assumptions.

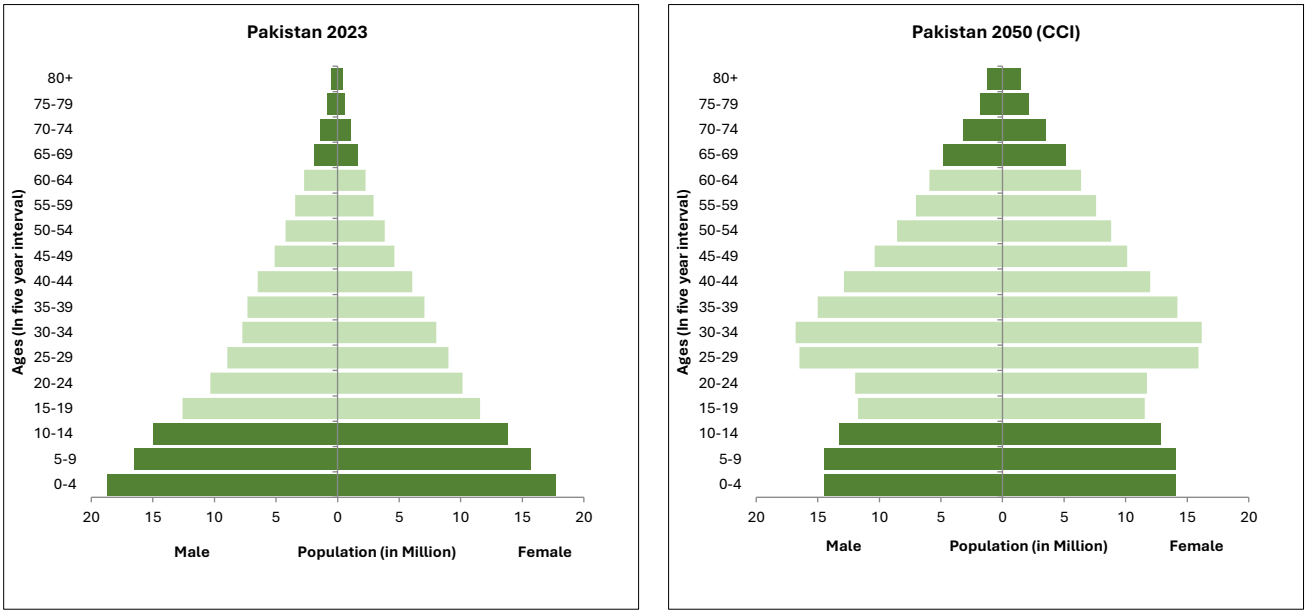
Under the CCI scenario, the population will reach 338 million by 2050, nearly 47 million fewer than in the BaU scenario. However, even with a rapid decline in fertility, the number of births will continue to rise due to large female cohorts entering reproductive age (Figure 3.9; Table A2: Appendix A). Table A3 in the appendix provides a detailed breakdown of the total population projections for 2023–2050.

Figure 3.8: Population pyramids of Pakistan under Business as Usual (BaU) Scenario, 2023 and 2050



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Population and Housing Census 2023 data as a base for population projection under BaU fertility assumptions.

Figure 3.9: Population pyramids of Pakistan under Council of Common Interest (CCI) Scenario, 2023 and 2050



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Population and Housing Census 2023 data as a base for population projection under CCI fertility assumptions.

Share of Large Age Groups, 2024–2050

Figure 3.10 illustrates the transformation in age structure resulting from fertility decline under both scenarios. Under the CCI scenario, the decline in the proportion of children in the total population will accelerate after 2030. By 2050, the share of the young population under the CCI scenario is projected to drop from the current 41% to 25%, while under the BaU scenario, it will decline to 29%. The decline is more pronounced when looking at absolute population numbers rather than proportions, given the relatively short projection period of 27 years. For instance, Pakistan is projected to have nearly 30 million more children by 2050 if fertility continues to decline at the rate assumed in the BaU scenario.

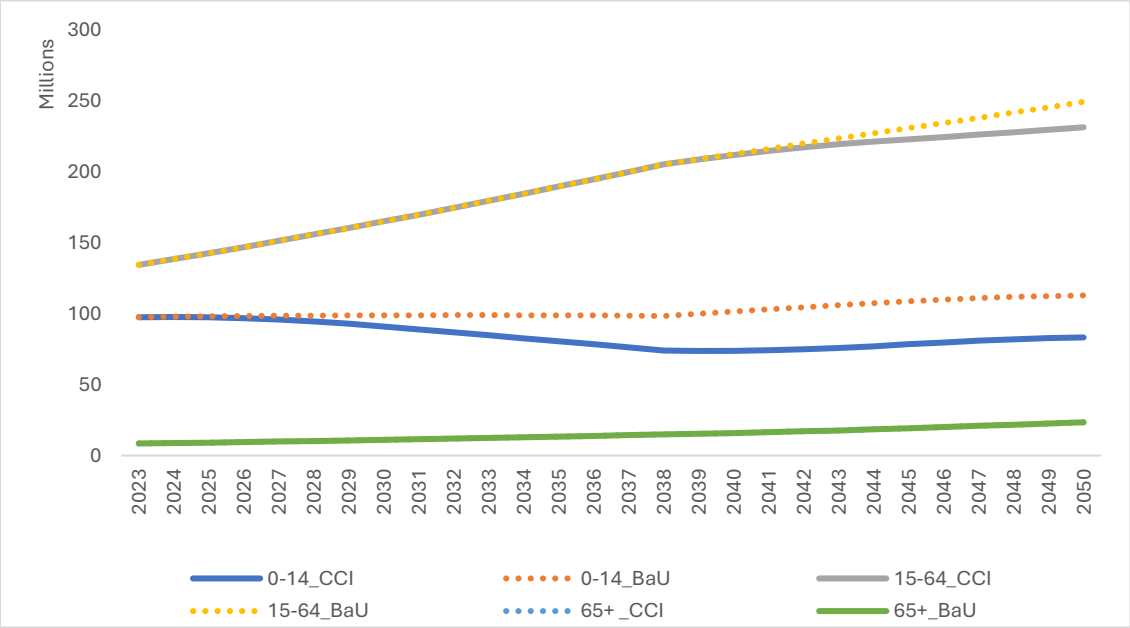
Conversely, the proportion of the elderly population will double during this period, rising from 4% to 7%. In absolute terms, the elderly population is expected to triple, increasing from 8 million in 2023 to 24 million by 2050. The significant rise in the elderly population will have important implications for health care and social protection systems.

The proportion of the working-age population (15–64) is projected to increase under both scenarios. Relative to 2023, Pakistan will have an additional 115 million in the working-age group by 2050 under the BaU scenario, and 97 million under the CCI scenario. In other words, the percentage of the working-age population will rise from 56% in 2023 to 68% by 2050, suggesting that Pakistan's demographic window of opportunity may extend beyond 2045, as previously predicted by Nayab (2008). Overall, the BaU scenario indicates that there will be 18 million more individuals in the active

age population (ages 15-64) if fertility declines according to the BaU path compared to the CCI scenario.

In this context, policies and initiatives aimed at increasing investment in youth education and upgrading the skill sets of the working-age population are particularly important. Failing to enroll the maximum number of young children in education and prepare them for gainful employment represent a missed opportunity to profit from the demographic dividend, thereby exacerbating Pakistan's socioeconomic development challenges (Mahmood, 2011).

Figure 3.10: Share of large age-groups under two Scenarios, 2023–2050

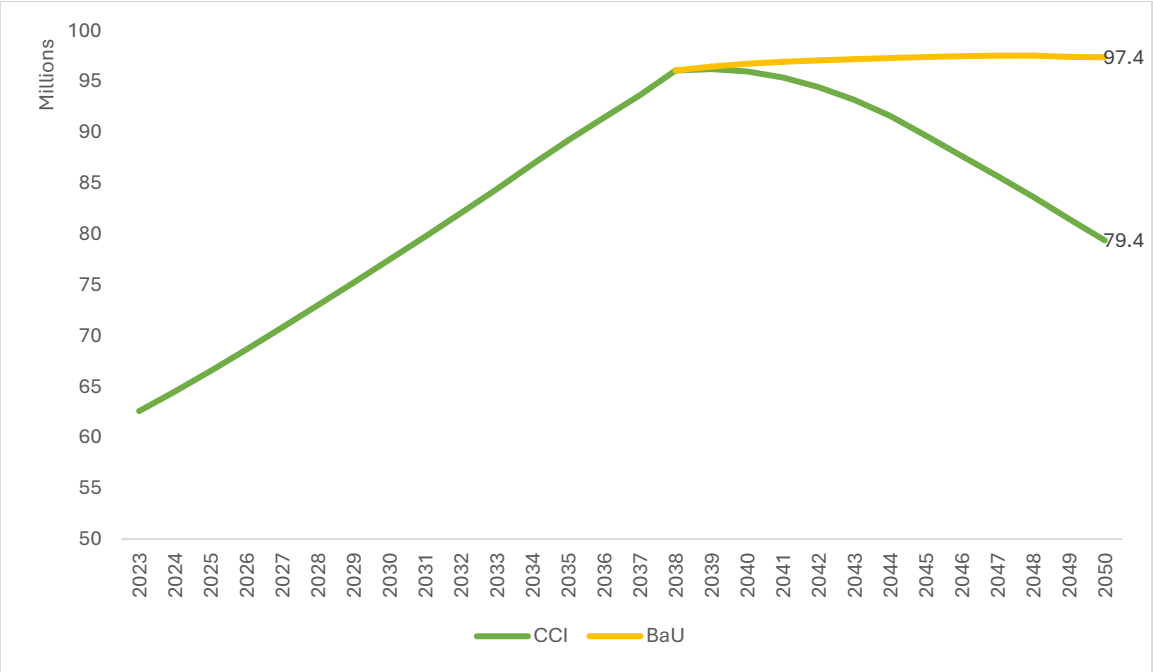


Source: Authors' calculation based on Census 2023 and Population Council fertility assumptions.

Youth Bulge (Ages 15–29)

In absolute terms, Pakistan's youth bulge is projected to peak in 2048, reaching 97.5 million individuals aged 15–29 before beginning to decline under the BaU scenario (Figure 3.11). The proportion of the population aged 15–29 relative to the total population will start to diminish by 2046 under both slow and BaU scenarios, with a more rapid decline anticipated under the CCI scenario.

Figure 3.11: Youth bulge age 15–29 under two scenarios, 2023–2050



Source: Authors' calculation based on Census 2023 and Population Council fertility assumptions

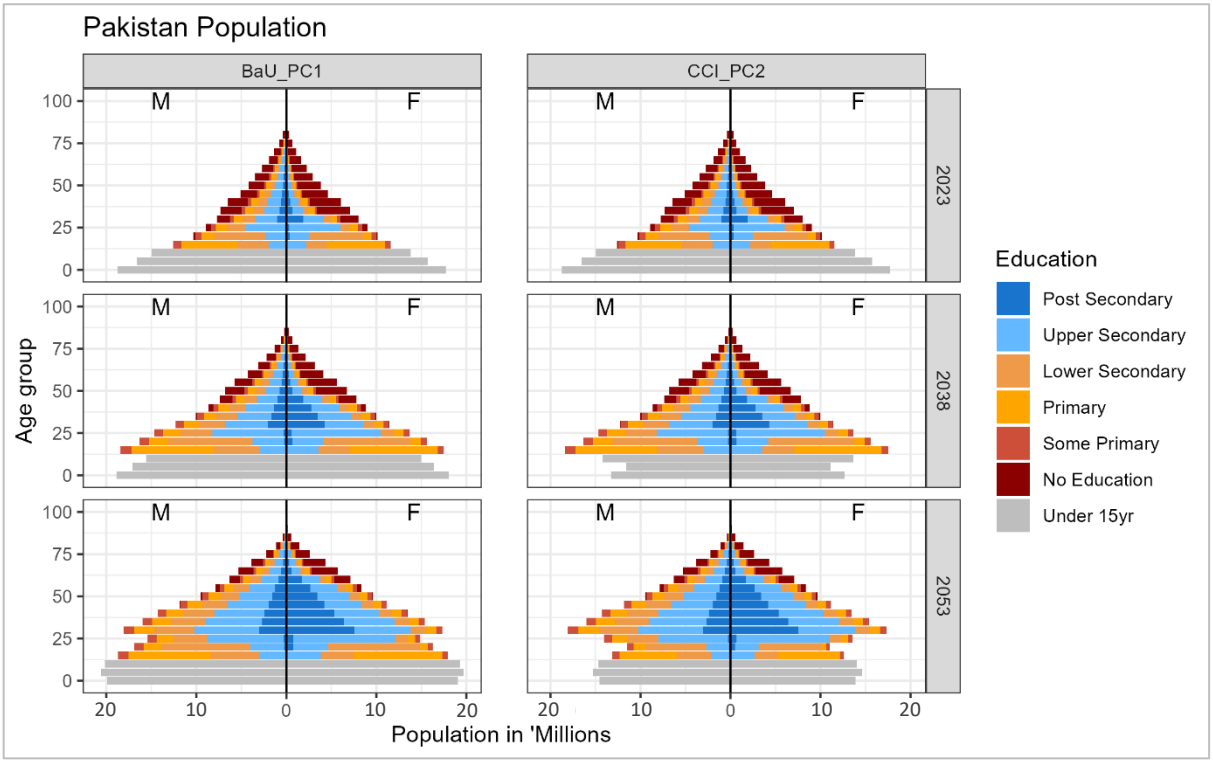
This presents a unique window of opportunity for substantial investments in human resource development when the percentage of the population in working age groups exceed that of other age groups, as indicated by a declining dependency ratio. Timely investments, particularly in secondary education—similar to those made by East Asian countries—can help maximize the benefits of the demographic dividend. However, as a population ages and the dependency ratio rises again, the window will gradually close, making the dividend less accessible.

Educational Attainment

The population structure of Pakistan by educational attainment for 2023, 2038, and 2053 is illustrated in Figure 3.12. The CCI scenario is unique, with its goal of universal school enrollment by 2030 and a more rapid decline in fertility. As a result, the size of the younger cohorts will decrease under the CCI scenario, except for a rise in the youngest cohort in 2050, driven by the faster increase in the number of women of reproductive age compared to the decline in fertility. It is reasonable to speculate that improvements in other educational transitions will impact the overall fertility levels, as a compositional change shifts more women into the lower-fertility group.

In all scenarios, the distribution of educational attainment is similar for cohorts born before 2020. Among the elderly population, the legacy of poor school enrollment continues to contribute to low levels of educational attainment, particularly among women.

Figure 3.12: Pakistan's population structure by age, sex, and educational attainment in two scenarios, 2023, 2038, and 2053



In both scenarios, we expect similar increases in levels of educational attainment, as the same education scenarios (ETPS) are applied. The last column of Table 3.4 indicates recent changes in lower secondary attainment (one of the SDGs) among those aged 20–39. Both scenarios show a moderate increase of 85% by 2050. Notably, the gender difference favors women, who are projected to be 9 percentage points ahead of men by 2053.

Table 3.4 also shows the education distribution among adults aged 25 by sex and level of education. The proportion of individuals who have never attended school is an indicator of developmental progress, with changes occurring gradually due to momentum—from 38% in 2023 to 8% by 2053 under the Policy Stimulus education scenario. Conversely, we expect a significant increase in the proportion of individuals with post-secondary education, rising from 8% in 2023 to 14% for males and from 8% to 30% for females by 2053. This is crucial for driving the country's development. The gender gap favoring women is notably higher for post-secondary education. This reflects the current trends, where females have increasing education progression rates, while males are experiencing negative progression rates.

Table 3.4: Share of population aged 25 years and over by educational attainment and proportion of females aged 20–39 with at least lower secondary educational attainment, 2023, 2038, and 2053

Sex	Time	Share of population aged 25 years and over by levels of educational attainment (in %)						Proportion At least secondary among those aged 20-39
			Primary		Secondary			
		No Education	Some	Completed	Lower	Upper	Post	
Both	2023	38	5	11	12	26	8	67
Both	2038	19	5	11	15	35	15	83
Both	2053	8	5	11	16	39	22	85
Female	2023	46	4	9	8	24	8	67
Female	2038	23	4	9	10	35	19	87
Female	2053	10	4	8	10	38	30	90
Male	2023	31	6	12	16	28	8	67
Male	2038	14	6	13	20	35	11	79
Male	2053	6	6	13	22	39	14	81

The two scenarios presented here show the impact of fertility on Pakistan's population size and structure. Since the overall fertility is exogenously imposed, the independent effect of educational improvements on fertility cannot be demonstrated in this analysis. The model can, however, be further utilized to explore alternative scenarios, such as changing education scenarios with education-specific fertility rates derived from the previously discussed scenarios.

Implications for the Education Sector

Change in population dynamics have implications for investments in human capital. Increases in life expectancy, resulting from improved health and higher returns on education, encourage parents to invest in their children's education. An educated and skilled population earns higher wages, increases labor productivity, and enhances the living standards of the community. However, to invest in quality education, particularly at higher levels, the burden on the education system must be alleviated by lowering fertility. Changes in childbearing behavior immediately affect the school-aged population.

Projections of School Enrollment

The school-age population, spanning pre-primary to tertiary levels, is projected to increase from 112 million in 2023 to 142 million in 2050—an almost 27% increase (Table 3.5). Due to the ongoing demographic transition, Pakistan has a huge youth bulge, which is evident in the increase in the growing school-age population at the tertiary level. By 2040, Pakistan will have 48 million school age-population at the tertiary level. This represents a 53% increase in the population aged 16–22 between 2023 and 2040. Similarly, due to very slow decline in fertility rates, the burden of investment in basic education will persist, with an expected 19% increase in primary-age children between 2023 and 2050.

Table 3.5: Projection of the school-age population (million), by level of education, age of student, and sex

	2023	2025	2030	2035	2040	2045	2050
	Male						
Pre-primary, 3–4 years	7.257	7.406	6.164	6.671	7.265	7.748	7.783
Primary, 5–9	16.567	17.359	17.268	15.693	17.049	18.507	19.471
Secondary, 10–15	17.688	18.544	20.515	20.804	18.629	20.215	21.964
Tertiary, 16–22	16.271	17.578	20.709	23.049	24.673	22.123	22.856
Total	**57.783**	**60.887**	**64.656**	**66.216**	**67.615**	**68.593**	**72.074**
	Female						
Pre-primary, 3–4 years	6.860	7.012	5.978	6.523	7.050	7.494	7.582
Primary, 5–9	15.705	16.492	16.513	15.298	16.716	17.930	18.891
Secondary, 10–15	16.297	17.270	19.511	19.903	18.168	19.835	21.346
Tertiary, 16–22	15.320	16.255	19.209	21.917	23.604	21.516	22.448
Total	**54.183**	**57.029**	**61.211**	**63.640**	**65.538**	**66.774**	**70.267**
	Total						
Pre-primary, 3–4 years	14.117	14.417	12.142	13.193	14.315	15.241	15.365
Primary, 5–9	32.272	33.852	33.781	30.991	33.764	36.437	38.363
Secondary, 10–15	33.985	35.814	40.026	40.707	36.797	40.050	43.310
Tertiary, 16–22	31.591	33.833	39.919	44.965	48.276	43.639	45.304
Total	**111.965**	**117.916**	**125.868**	**129.857**	**133.153**	**135.367**	**142.341**

Source: Authors' calculation based on Census 2023 under BaU fertility assumptions

To truly reap the benefits of the demographic dividend, Pakistan must invest in ensuring that all school-age children receive an education. Currently, 26 million children aged 5–16 years are out of school (PBS, 2024). Simply having the right proportion of school-going populations does not automatically yield demographic benefits (Nayab, 2008). Without careful planning and investment in quality education, Pakistan risks ending up with a large, uneducated, and unskilled population, which could hinder rather than promote economic development. It is crucial to recognize that the slow decline in fertility presents a barrier to being able to shift focus from basic education to higher-quality formal and skilled education.

Projection of Net Enrollment Ratios

It is important to acknowledge that education indicators in Pakistan are not promising. For instance, nearly 40% of the population aged 10 years and older has no formal education. Additionally, the literacy rate among females is fifteen percentage points lower than their male counterparts (PBS, 2024). Available evidence indicates a gradual increase in school enrollment among younger cohorts in Pakistan. The net enrollment rate at the primary level is slightly above 50%, with 54% of boys and

48% of girls aged 5–9 years attending primary school in 2019–2020. While the educational mix has improved since the 1990s, progress has yet to close the gender gap (Mahmood, 2011). Moreover, the enrollment rate has declined in recent years, falling from 58% between 2012–2013 to 51% during 2019-2020. This decline raises questions about Pakistan's ability to achieve universal primary education by 2030, in line with the SDG goals.

The trends in school-enrollment ratios at the middle and high school level are also concerning, as there is a significant dropout rate at these stages for both boys and girls (Table B1: Appendix B).

Table 3.6 shows the projected net enrollment by level of education. For a crude estimate, we extrapolated current net enrollment trends into the future, projecting through 2050 (Table B2: Appendix B). The projected school enrollments indicate the future stock of human capital and the educated workforce available to maximize the benefits of the demographic transition.

The number of students across all levels of education is expected to grow from nearly 34 million to 60 million between 2023 and 2050 (Table 3.6). However, this growth will not be evenly distributed. Changes in the age structure will lead to increased demand for education at the middle and high school levels. Enrollment at the middle and high school level is projected to more than double, from 9 million to 21 million, and high school enrollment is expected to increase from 4 million to 10 million between 2023 and 2050. This growth necessitates increased investment and expenditure on education.

Table 3.6: Projection of school enrollments (millions) by level of education, age of student, and sex, 2023–2050

	2023	2025	2030	2035	2040	2045	2050
	Boys						
Primary (class 1–5)	11.7	12.0	12.6	13.2	13.8	14.3	14.6
Middle (class 6–8)	4.6	4.9	5.8	6.8	7.9	9.2	10.4
High (class 9–10)	2.5	2.6	3.1	3.6	4.2	4.8	5.5
	Girls						
Primary (class 1–5)	9.6	9.9	10.9	11.9	12.9	14.0	14.9
Middle (class 6–8)	3.7	4.0	4.9	5.9	7.0	8.3	9.5
High (class 9–10)	1.7	1.8	2.2	2.7	3.2	3.8	4.4
	Total						
Primary (class 1–5)	21.3	21.9	23.5	25.1	26.7	28.3	29.6
Middle (class 6–8)	8.3	8.9	10.7	12.7	14.9	17.4	20.0
High (class 9–10)	4.1	4.5	5.3	6.3	7.4	8.6	9.8
Overall Total	**33.7**	**35.3**	**39.5**	**44.1**	**49.0**	**54.3**	**59.4**

Source: Authors' calculation using data from Pakistan Education Statistics (various issues) by NEMIS-PIE, Ministry of Federal Education & Professional Training, Government of Pakistan and Population Projection, BaU Scenario.

Projections of the Number of Schools

As noted above, that projected increase in school enrollment will require investment in educational infrastructure, particularly the number of schools to accommodate the rising student population. Currently, there are 136,276 primary schools, 47,345 middle schools, and 34,262 high schools in Pakistan (PES, 2021–2022). On average, there are 146 students per primary school, 162 per middle school, and 114 per high school.

To project the number of schools needed at different educational levels, we maintained the current student-to-school ratio. Estimates indicate that Pakistan will require an additional 76,000 middle schools, 66,000 primary school, and 52,000 high schools by 2050 (Table 3.7). Specifically, between 2025 and 2030, around 11,000 new primary schools will be needed, translating to approximately 2,000 schools per year. This number is expected to decrease between 2045 and 2050 due to a decline in fertility rates. However, the demand for new middle and high schools will increase dramatically. Between 2025 to 2030, Pakistan will need around 2,000 new middle schools per year to maintain the current student-to-school ratio, a number that will rise to 3,000 by 2050.

Table 3.7: Number of schools projected to meet enrollments at current student per school ratio, 2023–2050

Year	Projected Total Number of Schools (Thousand)		
	Primary	Middle	High
2023	145.9	51.0	36.4
2025	150.1	55.0	39.2
2030	160.9	66.0	46.7
2035	172.0	78.4	55.3
2040	183.1	92.3	64.9
2045	193.7	107.5	75.4
2050	202.5	123.3	86.3

Source: Authors' calculation using data from Pakistan Education Statistics (various issues) by NEMIS-PIE, Ministry of Federal Education & Professional Training, Government of Pakistan and Population Projection, BaU Scenario.

Projections for the Number of teachers

To improve the quality of education, it is important to maintain a balanced student-to-teacher ratio. The current student-to-teacher ratios are 46:1 at the primary level, 18:1 at the middle level, and 7:1 at the high school level (PES 2021-22). For future projections, we kept the student-to-teacher ratio at current levels, except for a reduction to 40 students per teacher (Table 3.8) at the primary level.

The demand for teachers, particularly at the high and middle school levels, will increase massively. By 2050, Pakistan will need approximately 800,000 new high school teachers, up from the current 579,986 teachers (2021–2022), translating to about 30,000 new teachers annually from 2023 to 2050.

Table 3.8: Projections for the number of teachers required by level of education, 2023–2050

Year	Total Number of Teachers required (Thousand)		
	Primary	Middle	High
2023	532.5	459.0	592.8
2025	547.9	495.0	637.9
2030	587.2	593.4	761.4
2035	627.8	705.4	901.6
2040	668.3	830.3	1057.8
2045	707.0	967.1	1228.8
2050	739.1	1109.0	1405.6

Source: Authors' calculation using data from Pakistan Education Statistics (various issues) by NEMIS-PIE, Ministry of Federal Education & Professional Training, Government of Pakistan and Population Projection, BaU Scenario.

Implications for the Labor Force Sector

As noted previously, if current fertility trends continue, Pakistan's population will increase by 57% by 2050. This unprecedented growth will have substantial implications for the labor market. Changes in age structure will lead to an increase in the working-age population. According to labor force survey data, the working age group (15 years and over) grew by 31.5 million between 2010–2011 and 2020–2021, translating to over 3 million additional individuals each year (Table 3.9). The average annual growth rate of the working-age population is 2.7%, considerably higher than the overall population growth rate. Given this increase, it will be challenging for the labor market to absorb the continual influx of working age individuals.

Table 3.9: Working-age population (million) age 15 and above, 2010–2011 and 2020–2021

Period	Male	Female	Total
2020–2021	67.07	66.44	133.51
2010–2011	51.49	50.51	102.00

Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Labour Force Survey (LFS) 2020-2021.and 2010–2011.

Table 3.10 shows the working-age population (15 years and older) by sex and age group under the BaU scenario. By 2030, the working-age population is expected to reach 176 million, with an additional 97 million by 2050—resulting in a total of 273 million, with roughly equal proportions of males and females.

Table 3.10: Projection of working-age population (million) by age and sex under the Business as Usual (BaU) assumption

Gender	Age	2023	2025	2030	2035	2040	2045	2050
Males	15–24	22.91	24.66	29.00	32.64	34.22	32.58	32.40
	25–34	16.68	17.52	20.31	24.22	28.50	32.11	33.68
	35–44	13.79	14.26	15.31	17.09	19.84	23.68	27.89
	45–54	9.31	10.01	12.03	13.55	14.57	16.30	18.94
	55–64	6.16	6.53	7.50	8.86	10.67	12.03	12.97
	65+	4.70	4.94	5.75	6.73	7.84	9.31	11.16
	15+	73.54	77.92	89.91	103.10	115.64	126.00	137.04
Females	15–24	21.71	23.03	26.92	30.92	32.79	31.59	31.80
	25–34	17.04	17.82	19.93	22.81	26.65	30.60	32.45
	35–44	13.11	13.88	15.65	17.53	19.61	22.42	26.21
	45–54	8.45	9.20	11.38	13.43	15.13	16.94	18.95
	55-64	5.21	5.68	6.97	8.54	10.52	12.40	14.00
	65+	3.83	4.22	5.30	6.64	8.08	9.93	12.29
	15+	69.36	73.83	86.14	99.87	112.78	123.88	135.71
Total	15–24	44.62	47.69	55.92	63.56	67.01	64.18	64.20
	25–34	33.72	35.33	40.24	47.03	55.15	62.70	66.13
	35–44	26.90	28.14	30.97	34.63	39.44	46.10	54.10
	45–54	17.77	19.22	23.41	26.99	29.70	33.23	37.90
	55–64	11.37	12.21	14.46	17.40	21.19	24.42	26.96
	65+	8.53	9.15	11.05	13.37	15.92	19.24	23.45
	15+	142.91	151.75	176.05	202.97	228.42	249.88	272.75

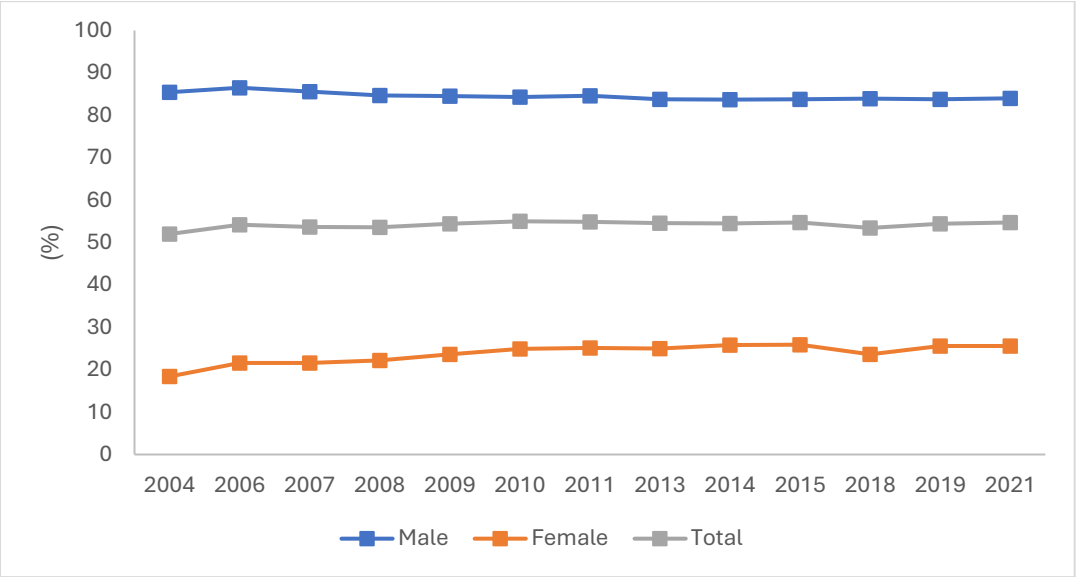
Source: Authors' calculation based on Census 2023 and Population Projection, BaU Scenario.

The changes in age structure will impact the size of the labor force and the dynamics of the labor market. The number of new entrants (ages 15–24) in the working age group will grow until 2040, followed by a modest decline in the subsequent decade. Meanwhile, the number of individuals exiting the labor market (ages 55 and above) will continue to rise due to aging and increased retirement age, partially offsetting the large number of entrants.

Projections of Labor Force Participation by Age Group and Sex

As noted in Chapter 2 by Bashir et al. (2024), another aspect of demographic transition is the increase in female labor force participation. However, in Pakistan, the female labor force participation remains consistently low. Only one-quarter of women of the working age group are active in the labor market.

Figure 3.13: Trends in labor force participation rate by sex



Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Labour Force Survey (LFS) 2004-2021

Since no population has a 100% participation rate, we assume that current participation trends among males, females, and the total population will continue into the future to estimate the projected active working-age population by age and sex. The active working-age population is projected to increase from 82 million in 2025 to 135 million by 2050—an increase of nearly 1.6 times over twenty-five years (Table 3.11). Although the number of active females will double in absolute terms, their share of the labor force is expected to remain modest at 29%. Despite projecting the current low female labor force participation rate into the future, these figures represent a significant challenge for the labor market. As women's education improves, more women are likely to enter the labor market and seek productive employment opportunities. Courbage et al. (2016) argue that the economic sector and unemployment rates will need to adapt to accommodate the rapidly growing active population, rather than the other way around.

Table 3.11: Projection of the labor force (million) by age group and sex under the Business as Usual (BaU) assumption, 2025–2050

Gender	2025	2030	2035	2040	2045	2050
Males						
15-24	14.51	16.28	17.44	17.36	15.65	14.69
25-34	17.14	19.93	23.84	28.13	31.78	33.44
35-44	14.16	15.26	17.03	19.76	23.59	27.78
45-54	9.80	11.82	13.37	14.42	16.19	18.88
55-64	5.11	5.71	6.56	7.68	8.40	8.79
65+	1.55	1.55	1.52	1.44	1.30	1.07
15+	62.26	70.55	79.76	88.80	96.91	104.65
Females						
15-24	5.79	7.09	8.51	9.42	9.45	9.89
25-34	5.54	6.70	8.23	10.28	12.56	14.13
35-44	4.46	5.31	6.25	7.33	8.78	10.71
45-54	2.96	3.87	4.83	5.73	6.74	7.91
55-64	1.14	1.35	1.60	1.90	2.15	2.33
65+	0.15	0.19	0.24	0.29	0.35	0.44
15+	20.05	24.51	29.66	34.94	40.03	45.41

Note: There may a minor difference in totals, due to rounding off factor.

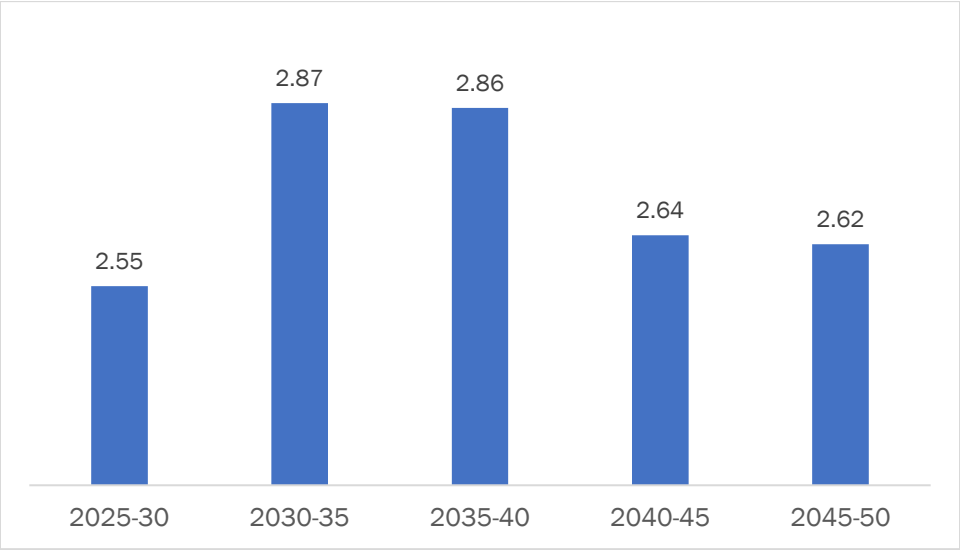
Source: Authors' calculation using Pakistan Bureau of Statistics, Government of Pakistan, Labour Force Survey (LFS) and Population Projection, BaU Scenario.

Projections of Jobs Creation

Providing quality jobs remains a top priority for governments worldwide. Goal 8 of the SDGs aims to promote inclusive and sustainable economic growth, employment, and decent work for all, underscoring the importance of decent employment opportunities in fostering economic development. The goal is to create meaningful job opportunities for all individuals, including men, women, young people, and persons with disabilities, while also reducing the gender wage gap by 2030.

Considering changes in population size and structure, as well as the increase of participation rates—particularly among women—the number of jobs that need to be created annually will rise from 2.55 million currently to nearly 3 million by 2035–2040, where it is expected to level off at 2.6 million (Figure 3.14). In other words, the Government of Pakistan needs to create an additional 13 million jobs every five year to accommodate the existing unemployed and influx of new entrants into the labor market. Given the anticipated increase in female labor force participation, job creation estimates and strategies should account for the likely rise in female participation, as well as those who are currently unemployed or underemployed.

Figure 3.14: Annual number of jobs to be created (million), 2025–2050



Source: Authors' calculations based on population projections BaU Scenario and projected participation rates.

Discussion and Conclusion

Pakistan's population is projected to grow rapidly by 2050—reaching between 338 million in the faster fertility decline scenario and 386 million in the Business-as-Usual scenario. This increase will be driven by a higher number of births than deaths, although the gap will gradually narrow as the aging population leads to a rise in the number of deaths. The rate of decline in the fertility rate will be a key factor influencing the pace of population growth.

What does this increase of at least 100 million during the next 27 years mean for Pakistan? Will it bring more opportunities or challenges?

A growing population implies a higher demand for essential resources such as food, water, energy, healthcare, and education. These projections provide valuable foresight for planners and policymakers to anticipate and prepare for future needs. While some outcomes of population growth may be beneficial, others could present challenges that require proactive management. Policymakers can focus on mitigating or adapting to these potential challenges to ensure sustainable development.

An expanding working-age population is generally seen as a positive population growth, especially when accompanied by higher levels of human capital. Increased educational attainment among younger generations could have a transformative effect on the country's labor force. We have demonstrated a positive impact on human capital with achieving universalizing school enrollment. If progress in educational attainment continues, particularly at higher levels, there will be a greater demand for education, leading to a ripple effect of increased overall educational attainment. To meet this demand, more investment in education will be essential. However, these investments will

only yield benefits if they are matched by the creation of jobs and opportunities. Without sufficient employment opportunities, a lack of prospects at home might drive the population to seek jobs abroad, increasing emigration flows.

Furthermore, efforts to increase educational attainment should focus not only on universal school enrollment but also on achieving targets like the SDG of universal secondary education. Higher levels of educational attainment will have far-reaching effects on almost all aspects of demography—particularly fertility and broader socioeconomic development.

The findings, conclusions and policy recommendations derived from the Population Council's study, *Capturing the Demographic Dividend in Pakistan*, have remained remarkably consistent since its initial release in 2013 (Sathar, Royan, and Bongaarts, 2013). Exactly a decade later, our current analysis yields similar results, underscoring the urgent need for educational reforms and infrastructure development to address the rapid population increase.

One of the primary conclusions of our chapter is the necessity for achieving universal enrollment of children in schools. This goal will require the construction of more schools to accommodate the growing number of students. In addition, there is a pressing need to hire more qualified teachers at all levels to ensure quality education.

Our findings also reaffirm the critical importance of investing in female education as a fundamental strategy for reducing fertility rates. As mentioned above, educated women demonstrate a greater acceptance of family planning practices and are more inclined to have fewer children. This is primarily due to the availability of employment opportunities for educated women, which subsequently raises the opportunity cost of having larger families.

Furthermore, our analysis emphasizes the importance of investing in the education and skill development of its working-age population to fully capitalize on the potential benefits of demographic dividend. Projection results indicate that the working-age population is expected to increase from 82 million in 2025 to 135 million by 2050. In light of this demographic shift, the government will need to create at least 2.6 million jobs annually to accommodate the burgeoning labor force.

Pakistan's growing labor force will require the country to provide gainful employment, and policy should focus on investing in human capital and creating jobs, particularly for women and young people. To empower, educate, and employ young people, coordinated overlapping investments are needed to realize the demographic dividend. It is important to emphasize that women's empowerment is central to the concept of the demographic dividend. Therefore, formulating and implementing policies that eliminate all types of discrimination and violence against women are crucial for advancing gender equality, women's employment, and social protection. Additionally, to address unmet needs and provide access to reproductive choice, which allows women and couples to decide on the number, timing, and spacing of their children, investments in enhancing access to high-quality reproductive health services, including family planning, are essential.

In conclusion, strong political commitment, sustained investment in education, particularly for women, and robust job creation strategies, are imperative for harnessing the demographic dividend and fostering sustainable economic growth in Pakistan.

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Appendix A

Table A1: Decomposition of the Change in Pakistan Population Projection 2023–2053, according to the Business as Usual (BaU) Scenario with a Slower Decline in Fertility

	Time	Population	Births	Deaths	NC Ratio
1	2023	240,437,757	32,410,256	7,517,431	4.31
2	2028	265,330,582	35,054,965	7,957,193	4.41
3	2033	292,428,344	38,233,050	8,683,548	4.4
4	2038	321,977,799	40,779,033	9,476,062	4.3
5	2043	353,280,747	41,382,119	10,301,369	4.02
6	2048	384,361,465	39,738,144	11,176,578	3.56
7	2053	412,922,984	0	0	NA

Note: NC Ratio = natural change ratio (births/deaths).

Table A2: Decomposition of the Change in Pakistan Population Projection 2023–2053, according to the Council of Common Interests (CCI) Scenario with a Faster Decline in Fertility

	Time	Population	Births	Deaths	NC Ratio
1	2023	240,437,757	29,575,540	7,382,601	4.01
2	2028	262,630,696	23,802,754	7,483,770	3.18
3	2033	278,949,670	26,863,070	8,230,541	3.26
4	2038	297,582,183	29,744,203	9,087,776	3.27
5	2043	318,238,588	30,736,727	9,958,970	3.09
6	2048	339,016,312	28,982,873	10,837,708	2.67
7	2053	357,161,430	0	0	NA

Note: NC Ratio = natural change ratio (births/deaths).

Table A3: Total Projected Population (million) by Sex Under Business as Usual (BaU) Scenario and Council of Common Interests (CCI) Scenario, 2023–2050

Year	BaU			CCI		
	Male	Female	Total	Male	Female	Total
2023	123.82	116.61	240.44	123.82	116.61	240.44
2024	126.07	119.06	245.13	125.94	118.93	244.88
2025	128.37	121.54	249.91	127.97	121.16	249.13
2026	130.69	124.07	254.76	129.89	123.29	253.18
2027	133.05	126.62	259.68	131.69	125.31	257.00
2028	135.45	129.21	264.66	133.38	127.21	260.59
2029	137.88	131.84	269.72	134.93	128.99	263.92
2030	140.34	134.51	274.86	136.35	130.64	266.98
2031	142.84	137.22	280.06	137.80	132.33	270.12
2032	145.38	139.97	285.35	139.29	134.05	273.34
2033	147.95	142.77	290.72	140.82	135.82	276.64
2034	150.57	145.61	296.18	142.39	137.63	280.02
2035	153.22	148.49	301.71	144.00	139.48	283.48
2036	155.91	151.41	307.33	145.65	141.38	287.03
2037	158.64	154.21	312.86	147.34	143.18	290.52
2038	161.41	157.06	318.47	149.07	145.02	294.09
2039	164.20	159.94	324.14	150.84	146.90	297.74
2040	167.01	162.84	329.85	152.63	148.82	301.45
2041	169.84	165.77	335.61	154.45	150.77	305.22
2042	172.67	168.71	341.38	156.28	152.74	309.03
2043	175.52	171.67	347.18	158.14	154.74	312.88
2044	178.35	174.62	352.96	160.00	156.74	316.74
2045	181.14	177.53	358.66	161.83	158.72	320.54
2046	183.88	180.39	364.27	163.62	160.65	324.27
2047	186.57	183.22	369.78	165.36	162.55	327.91
2048	189.20	185.99	375.19	167.05	164.40	331.45
2049	191.77	188.71	380.48	168.68	166.18	334.86
2050	194.27	191.35	385.62	170.22	167.88	338.10

Appendix B

Table B1: Net Enrollment Rates (percentage) by Sex and Level of Education (Age of Student), 1990–2020

Survey Year	Primary			Middle			High		
	Age 5–9, Class 1–5			Age 10–12, Class 6-8			Age 13–14, Class 9–10		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
1990–1991	53.1	38.9	46.2	22.5	10.8	17.0	10.0	5.7	7.8
1995–1996	49.3	37.9	43.8	18.6	10.6	14.7	9.4	6.6	8.0
1996–1997	46.0	37.2	41.8	18.9	12.1	15.6	9.4	6.7	8.1
1998–1999	46.8	36.8	41.9	19.4	13.4	16.5	10.5	7.5	9.0
2001–2002	46.4	38.3	42.4	17.0	14.5	15.8	10.0	8.0	9.0
2004–2005	56.3	48.1	52.4	19.8	16.0	18.0	11.2	9.9	10.6
2005–2006	56.4	48.4	52.6	18.6	16.4	17.5	9.7	9.2	9.5
2006–2007	59.7	51.1	55.6	19.9	15.9	18.1	10.4	9.0	9.7
2007–2008	58.6	51.9	55.3	18.5	17.0	17.8	11.2	10.4	10.8
2010–2011	59.8	52.7	56.4	21.7	18.8	20.4	11.7	12.3	12.0
2011–2012	60.2	54.4	57.4	24.2	20.1	22.3	13.4	12.4	12.9
2012–2013	60.6	54.1	57.5	22.8	21.5	22.2	13.3	13.1	13.2
2013–2014	60.2	53.0	56.7	22.8	19.9	21.5	14.4	12.7	13.6
2014–2015	60.1	53.0	56.7	22.5	20.6	21.6	13.6	14.4	14.0
2015–2016	56.2	51.0	53.7	20.6	19.0	19.9	12.7	13.2	13.0
2018–2019	54.3	51.2	52.8	22.5	21.3	21.9	14.4	13.9	14.2
2019–2020	53.6	48.3	51.1	22.1	20.7	21.4	12.8	12.5	12.6

Table B2: Projection of Net Enrollment Ratios (percentage) by Level of Education (Age of Student) and Sex, 2023–2050

	2023	2025	2030	2035	2040	2045	2050
Male							
Primary (class 1–5, age 5–9)	60.8	61.6	63.5	65.3	67.2	69.1	70.9
Middle (class 6–8, age 10–12)	22.8	23.0	23.6	24.3	24.9	25.5	26.2
High (class 9–10, age 13–14)	14.5	14.8	15.7	16.6	17.5	18.4	19.3
Female							
Primary (class 1–5, age 5–9)	57.3	58.6	61.9	65.1	68.4	71.6	74.8
Middle (class 6–8, age 10–12)	23.4	24.3	26.4	28.4	30.5	32.6	34.7
High (class 9–10, age 13–14)	15.4	16.0	17.6	19.2	20.8	22.4	24.0

PART II

Economy, Structural Change, and Demography

CHAPTER 4

Interactions Between Economic Trends and Demographics: Evidence from Pakistan's Macro and Micro Data

Hanid Mukhtar

Introduction

Pakistan's economy is currently confronted with some daunting challenges. Economic growth has significantly slowed, external fragility has increased, public debt is approaching unsustainable limits, fiscal instability has worsened, inflation has remained stubbornly high, and both domestic investment and foreign direct investment have been falling. These problems stem from unaddressed structural weakness in the economy, heightened political instability, periodic external shocks, and the increased frequency of natural disasters.

In addition, Pakistan's high rate of population growth is seen by many as contributing to the country's economic troubles. Concerns about the adverse effects of high population growth are mainly expressed by demographers, the electronic and print media, and civil society. In contrast, voices from economists have been relatively few and largely muted. This may be due to the longstanding divide within the economic community, which has persisted for over two centuries, regarding the effects of population growth on the economy. One group considers population growth beneficial for the economy, while the other views it as detrimental economic growth and development.

This chapter will examine whether concerns about the negative effects of population growth on Pakistan's economy have any logical foundations. It will identify the pathways through which population growth has impacted the economy and will estimate the cost, if any, that the country has paid for its inability to better manage its population.

The paper is divided into four sections. Section I will summarize the long-running debate within the economic community on the relationship between population and economic growth, highlighting the key issues and arguments for and against the perceived negative effects of population growth on the economy. Section II will use macro data to explore the pathways between population size and economic wellbeing of households. Section III will use household data to explore the effects of household size on the wellbeing of households. Based on the findings of sections II and III, Section IV will reflect on the cost of the government's inaction on the issue of population.

Section I

Relationship Between Population and the Economy: The Theoretical Framework

The relationships between population dynamics and economic development have been widely investigated by economists and social scientists, resulting in starkly different theoretical explanations of the relationship.

Malthus (1798) believed that some key economic factors (e.g., land) are fixed or scarce. Therefore, a significantly high rate of population growth leads to a fall in labor productivity, which eventually causes a decline in economic growth, an increase in poverty, a rise in prices, and an adverse impact on the general wellbeing of the population. High population growth exerts pressure on these fixed factors, leading to their declining productivity and rising output prices, which, in turn, exacerbate poverty.

Since Malthus's time, economists, demographers, and other social scientists have debated whether and how high fertility and rapid population growth affect economic outcomes, and vice versa. The key areas of the debate have been: 1) Is the decline in labor productivity validated by empirical research? 2) What explains the general increase in per-capita income since Malthus, especially in Western countries? 3) Does population growth hamper or promote capital accumulation and innovation? 4) Is population growth a cause or effect of a decline in economic wellbeing and poverty?

While the debate on the first three questions continues, there is a fair degree of consensus on the impact of the economy on population growth. Most economists and demographers now agree that important indicators of living standards (such as per capita income, employment levels, working conditions, industrialization, energy consumption, education, health, life expectancy, etc.) lead to changes in parental perceptions of the costs and benefits of having children, which in turn results in lower fertility. Although there are significant differences between countries, and even within different regions of a country, regarding the timing and sequencing of these changes, there is a broad agreement on a causal relationship running from improved living standards to lower fertility (National Research Council 1986).[7]

Regarding the causality in the other direction, the debate can be summarized into three different different types of relationships: negative, positive, and transitional (Easterlin (1967); (Palumbo, L., Ferrara, A; and Varra, P. (2023).

Negative Effects

As mentioned earlier, Malthus was the first to propose a theory on the possible relationship between population and the economy, which became the cornerstone of classical economics. Malthus

[7] The change in thinking within the National Academy of Sciences (NAS) during the 1950–1990 period can be gauged by comparing the summary statements on the impacts of rapid population growth found in two major studies conducted by the prestigious NAS in the United States. The executive summary of the 1971 Report, *Rapid Population Growth: Consequences and Policy Implications,* cites a large number of adverse impacts of population growth, provides almost no qualifications regarding these negative effects, and fails to enumerate possible positive or countervailing impacts.

postulated that the population tends to grow in a geometrical progression, while the fixity of other factors of production (like land and capital) causes diminishing returns to labor and other factors of production. This implies that the means of subsistence can increase at a much slower pace than the population. This theory focuses mainly on the limited availability of natural resources that constrains both population and economic growth (Easterlin 1967).

However, due to technological advancements over the decades, no empirical evidence could be found for this postulated decline in productivity of scarce factors. This forced the neo-Malthusians to change their argument, without altering the main premise about the relationship between population, economic growth, and poverty. They argued that higher birth rates create an imbalance within the household and in the country at large. As the number of children increases relative to the number of working adults[8], household and national savings decline because funds that could have been invested in physical or human capital are channeled toward consumption for the growing population. This prevents countries and families from making the longer-term investments needed to raise the standard of living of the population (Ahlburg, 1998; Hodgson, 1997). The Coale and Hoover (1958) case study on India was a milestone in Malthusian analysis supporting population management policies.

Two arguments are often made regarding the adverse impacts of rapid population growth on the rate of economic development. The first, of Malthusian origin, suggests that a relatively "fixed" (or slow-growing) resource (land, according to Malthus, or other renewable and nonrenewable resources, according to neo-Malthusians) coupled with rapid population growth causes a reduction in output per worker. The second, of neoclassical origin, posits that rapid population growth leads to increasing scarcity of "productive capital" per worker, thereby leading to declining worker productivity.

In his neoclassical model of growth, population (labor) was taken as an exogenous variable which has a constant and “natural” growth rate independent of economic development. The impact of population on the output growth rate is divided into two distinct effects. An increase in population causes:

- An increase in the amount of labor—one of the two productive factors—which positively impacts both the absolute level of output and the steady-state output growth rate.
- Slower growth in capital stock, leading eventually to a lower capital per worker. This causes a decline in productivity and in the steady-state output per worker (Solow 1956).

Solow concluded that higher population growth per se would be detrimental to economic development. Later researchers used his model to prove that population growth has other negative effects on economic growth. Mason (1988) showed from theoretical and empirical perspectives that population growth may reduce saving propensity, thereby lowering potential investments. This leads to a further decrease in per capita physical capital per worker and thus in per capita steady-state output. The focus here is on the limited availability of physical capital, which, while not affecting population growth exogenously determined, does constrain economic growth (Easterlin 1967).

[8] The “age dependency.”

Despite this evidence, many economists demanded more robust evidence on the effect of fertility on economic development or poverty. For example, Schultz, while willing to acknowledge the plausibility that high fertility acts as a barrier to economic growth and poverty reduction, remained skeptical for many years about the strength and stability of the relationship as asserted by many neo-Malthusians. However, in 2013, Joshi & Schultz conducted a study using data from the famous Matlab family planning quasi-experiments of 1974–1996. They found that in the "program" villages and individual households, fertility declined by about 15% more than in the Rethinking the Role of structural Change in Fertility Transitional villages. They then looked at the impact of that decline on a series of long-term family welfare outcomes (e.g. women's health, earnings, household assets, use of preventive health inputs, and the intergenerational effects on the health and schooling of the woman's children, etc.). They found that within two decades, many indicators of the welfare of women and their children improved significantly in conjunction with the program-induced decline in fertility and child mortality. This suggests that the social returns to this reproductive health program in rural South Asia have many facets beyond fertility reduction, which do not seem to dissipate over two decades.

A study based on the Indonesian Family Life Survey, panel data over several years, allowed investigators to assess the effect of changes in desired and actual fertility at one point in time on subsequent household poverty (Canning & Schofield, 2007). It found that over a three-year period, one birth on average reduced the likelihood of female labor force participation by 20%. This decline in women's contribution to household income, in turn, reduced expenditure per capita in the household, pushing many families into poverty and preventing others from escaping poverty.

Recent research has brought forth the issue of population growth, economic growth, and poverty by highlighting that a high level of fertility implies a relatively younger population, and, thus, higher age dependency. As fertility declines, age dependency declines, and the proportion of the working-age population to the non-working population increases, leading to rising per capita income (as compared to per capita consumption), thus boosts savings and investment in the economy. This window of opportunity does not remain open indefinitely, as eventually, the age composition of the population will again increase dependency ratios when the proportion of retired and elderly people rises relative to the working-age population. Sensible utilization of this "demographic dividend" is critical to achieving higher and sustained economic growth (Bloom & Canning 2006).

Coale and Hoover summarize the adverse impacts of population growth on savings and capital formation.

1. **Age-dependency effect.** Rapid population growth leads to a high ratio of children to working adults (i.e., age dependency), which implies that every additional child causes a greater decline in household's per-capita income than in per-capita consumption, thus reducing the household's per-capita (and overall) savings.

2. **Capital-shallowing effect:** A rapid increase in population causes the labor force to grow faster than the economy's capacity to fully absorb it, at least at the prevailing real wage levels. This puts downward pressure on real wages. Lower real wages imply lower savings in the short run. In addition, lower wages make labor a more attractive factor of production compared to

capital. This increased labor intensity of production results in a lower capital-labor ratio, thereby reducing labor productivity, which has longer-term effects on wages and savings.

3. **Investment-diversion effect:** Rapid population growth generates a strong demand for government expenditures in areas such as social safety nets, education, and health, thereby diverting funds from relatively more productive, growth-oriented public and private investments. Even if one considers these expenditures as investments in human capital, there is an apparent diversion from shorter-term physical capital investments to longer-term human capital investments, which has at least a short-run impact on economic growth.

Positive Effects

The first social scientist known to challenge Malthusian theories from an economic point of view was Kuznets. He highlighted the possible positive effects of population growth on economic cycles, considering the three possible activities undertaken by people: production, consumption, and saving (Kuznets (1960). Although Kuznets did not provide a coherent framework to explain the positive relationship between population and economic growth, he was successful in providing a counterargument that later researchers developed into a deeper critique of Malthusian theories.

The so-called "revisionists" argued that a larger population leads to faster technological development, which results in increased labor productivity, higher per capita income, and improvements in living conditions (Simon, 1976; Kremer, 1993). They believed that technological development depended on population size for both: (a) innovation *technology pushed*, made more likely by the larger number of people; and (b) innovation *demand pulled* because a larger population creates new needs—and increases those already existing—granting higher rewards for the innovator (Ahlburg, 1998). The higher—and probably more stable—demand for consumption and investment goods is another positive effect of population growth that can lead to expansionary economic cycles.

In the revisionist paradigm, the focus of the argument shifts from constraints on natural and reproducible physical capital to knowledge. Therefore, production was theorized to be free from the diminishing returns to scale that characterized the previous economic analysis. Policy advice derived from this school of thought includes support for fertility and immigration in countries with declining or stationary populations.

Transitional Effects

More recent research has focused on the history of economic development and attempted to combine the two schools of thought mentioned above. These studies demonstrate that ancient history was characterized by a Malthusian regime, with slow technological progress and population pressure on the means of subsistence; productivity increases were absorbed by population growth, and income per capita did not increase substantially over time. However, the technological change during the Industrial Revolution led to a phase where population growth absorbed only a share of the rapidly growing output, leaving significant amounts for investment in physical and human capital, which resulted in even faster and more sustained economic growth. This, in turn, caused a demographic transition and a slowdown in population growth, leading to a virtuous cycle between population and economic growth.

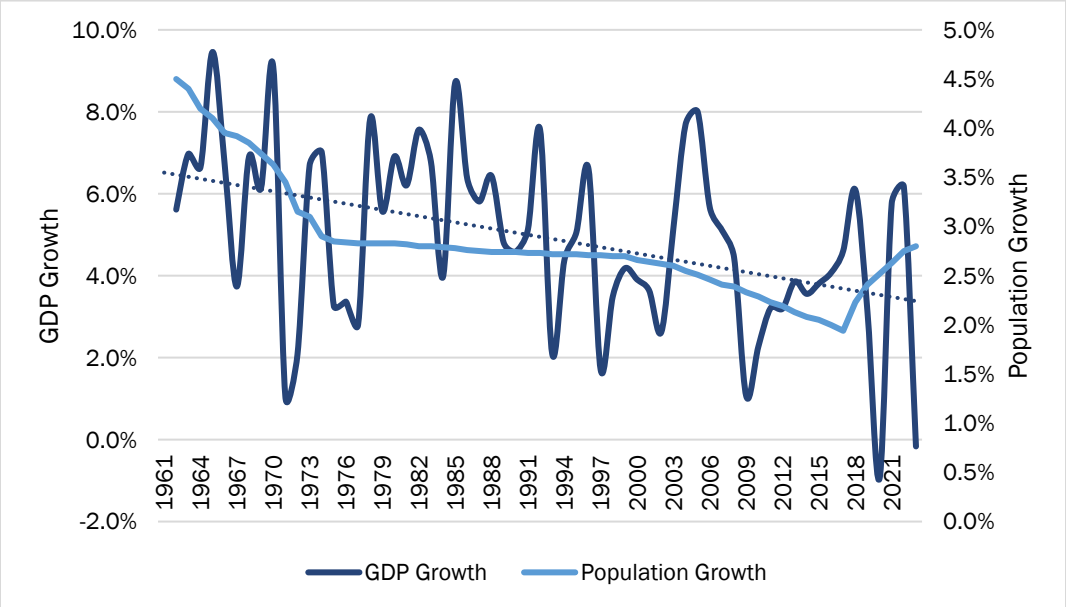
Another type of transitional effect relates to population age. In fact, the impact produced by population on economic growth may depend on the age structure. According to Crenshaw, Ameen, and Christenson (1997), population increase has an immediate negative effect because raising children absorbs resources—capital and labor—that could have more productive uses. However, when children grow up, they become workers and consumers; the lagged effect on economic growth is positive. Sarel (1995) added further complexity by considering age-related productivity. This argument, however, is more relevant in the case of the baby boom in the Western world, where birth rates saw a short-term spike and then relatively quickly returned to a normal trend. In developing countries where high birth rates are the norm, the dependency ratio is not expected to fall as sharply as it did in the West.

Section II

Population Growth and Its Impact on the Pakistani Economy

For the greater part of its history, Pakistan has shown strong economic growth, despite facing wars, periods of political turbulence, natural disasters, and other challenges. While economic growth has slowed down significantly since the 1990s, poverty has continued to decline. Pakistan is one of the first nations to devise and implement a population program. However, the population growth has remained one of the highest in the region, and, according to recent estimates, has increased over the last six years (Figure 4.1).

Figure 4.1: Trends in population and GDP growth



Any analysis of the relationship between population growth and economic outcomes must address several important and interesting questions:

1. Does a large number of household members diminish a family's present wellbeing and future prospects?
2. Does household poverty increase with its size? If yes, what explains the continuous decline in poverty despite the high rate of population growth?
3. Is rapid population growth a symptom, rather than a cause, of low national output and poor economic performance? In other words, do the debates occur at both the macro and micro levels regarding the direction of causality?
4. Does rapid population growth adversely affect the overall performance of the economy and its ability to achieve and sustain general wellbeing? If yes, what explains the relatively high rate of economic growth between 1960–1990, despite a rapid increase in population?

Relationship Between Population and the Macro Economy

After a sustained period of robust economic growth spanning 40 years (1950–1990), economic growth in Pakistan has slowed down. This trend has led people to ask two important questions.

First, how was Pakistan able to generate reasonably high rates of economic growth for such a long period despite the apparent unsustainability of economic growth given that the country's key economic fundamentals were weak? Savings and investment rates have been among the lowest in the region; the government persistently ran high fiscal deficits, and the country's external sector was plagued by natural and policy-induced weaknesses. In addition, Pakistan's social indicators have been chronically poor.

Second, why has economic growth slowed down in the latter part of its history, despite no fundamental change in economic policy, institutions, or other economic fundamentals?

The answer to both questions is the same. Growth in the early part of Pakistan's history was a result of some large investments in physical infrastructure (particularly in the irrigation sector) and was sustained by making certain policy compromises. The three most important of these compromises are:

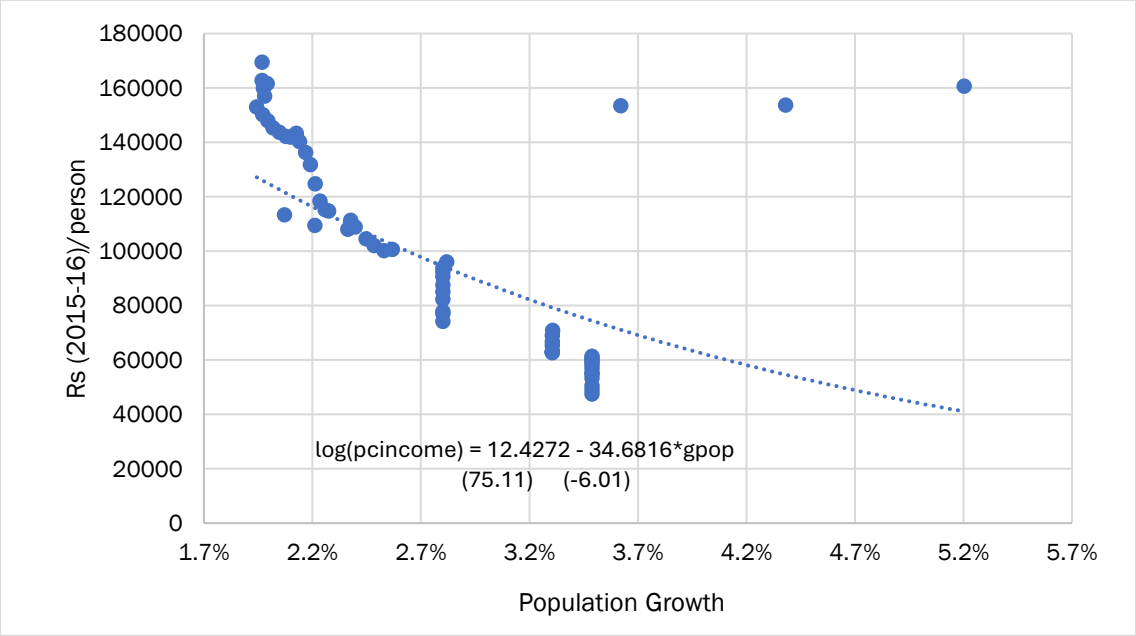
1. Continued adherence to import substitution policies, which resulted in domestic production of relatively poor-quality goods primarily for the domestic market. The anti-export bias of this policy is the key reason behind the chronic fragility of the country's external sector and a key contributor to the boom-and-bust growth cycle that Pakistan is currently associated with.
2. Partly due to incentives for investment and growth and partly due to political considerations, tax collection in Pakistan has lagged behind many countries with similar levels of per capita income and public expenditure needs. As a result, fiscal deficits have remained high. Reliance on domestic and external loans to finance these deficits has driven Pakistan to the verge of a debt crisis.
3. Low rates of national savings encourage short-term, consumption-induced growth spurts, which require higher investment to sustain. As domestic savings are insufficient to meet investment needs, the country has to rely on foreign savings, causing external debt to balloon.

In the absence of any course correction, these "errors" expanded and deepened over time, leading to the economic slowdown.

This section will investigate if there was a fourth (major) factor that contributed to the economic slowdown: the unabated high rate of population growth. Following the leads for Section I, we explore the following possible pathways from population growth to economic growth and development:

Pathway I—Resource Dilution Effect: The first and foremost effect of a fast-growing population is a decline in per-capita income. Figure 4.2 shows the relationship between real per capita income (in 2015–2016 prices) and population growth in Pakistan between 1961–1962 and 2022–2023. It shows that if population growth increases by one percent, real per-capita income declines by over Rs 35,000 per annum (about one-third of the average per-capita income for the period).[9] This estimated relationship spans 61 years and is robust enough to dispel the assertion that the relationship between population growth and per capita income is valid only in the short run.

Figure 4.2: Per capita income and population growth



The explanation of this relationship is not very complicated. A higher rate of population growth causes the population to increase rapidly, which leads to national income being shared by a greater number of people, i.e. *the resource dilution effect*.

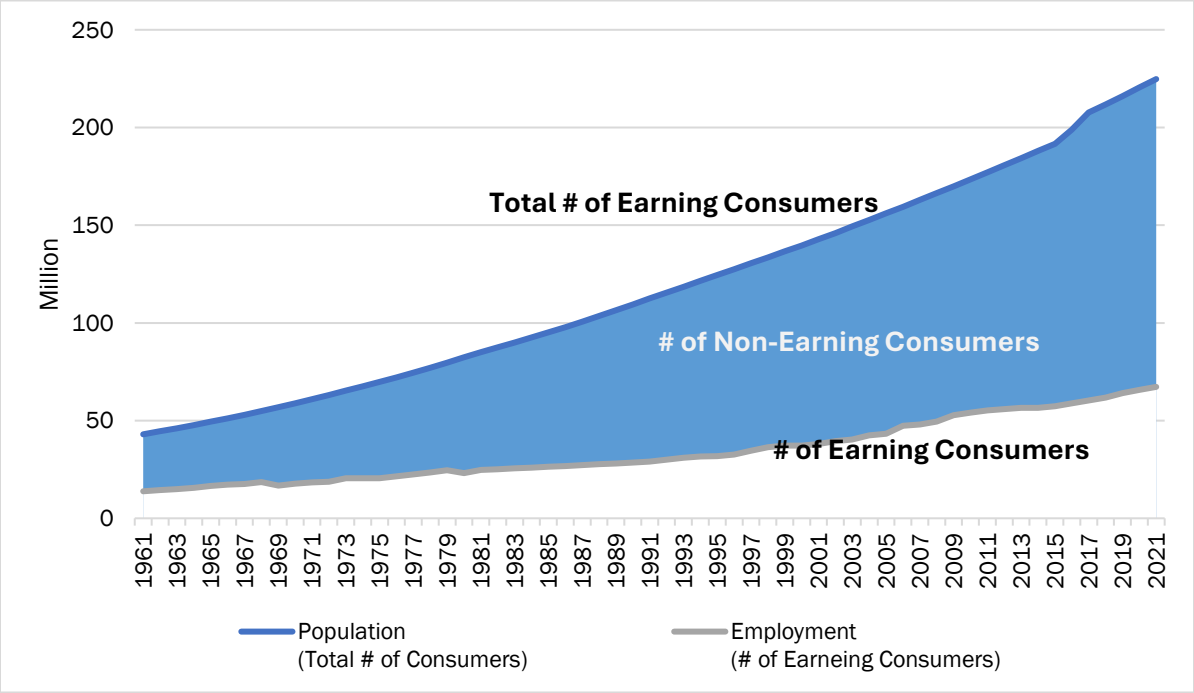
The increase in population implies an increased number of consumers, primarily at the lower end of the population age profile. In the short run (15 to 18 years), the number of earners does not increase at the same rate as the 0–15 group, leading to a higher income dependency ratio (Figure 4.3). This causes a rapid increase in consumption without a commensurate increase in national income, as higher birth rates do not enhance the productive capacity of the economy, which depends on factors

[9] The figure is based on MOF data. There are three clear outliers to the trend of population growth corresponding to the years 2015-16, 2016-17, and 2022-23. These are the census years. Perhaps, MOF has tried to "force" its population estimate to conform to censuses estimates.

like the accumulation of capital, labor force quality, technology, and natural resources. Higher births have little to no effect on any of these "factors of production," except for increasing labor force quantity and potentially capital accumulation.

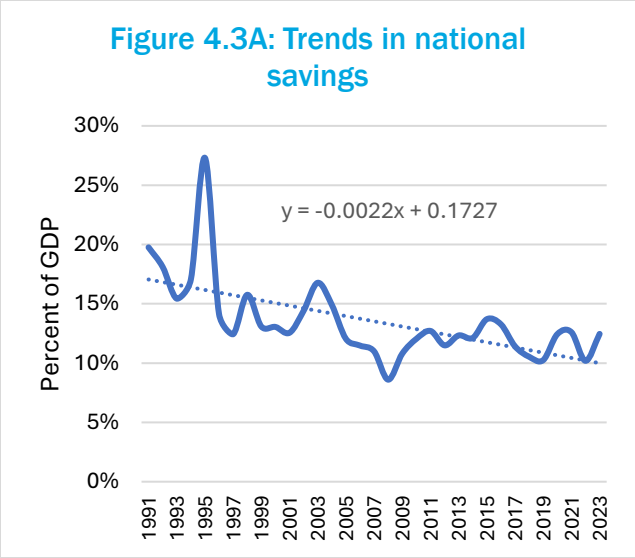
The ability of a country to save decreases as more children force families to divert a part of their savings toward increasing consumption (Figure 4.3A). Lower savings, coupled with the possibility of diverting investment toward consumption, leads to slower capital accumulation (Figure 4.3B). The first effect on capital accumulation is negative and immediate, as the savings potential of an economy declines with a larger population. The second effect on labor force quantity may be positive but occurs with a time lag of at least 15 years since the quantity of the labor force would be larger than otherwise.[10]

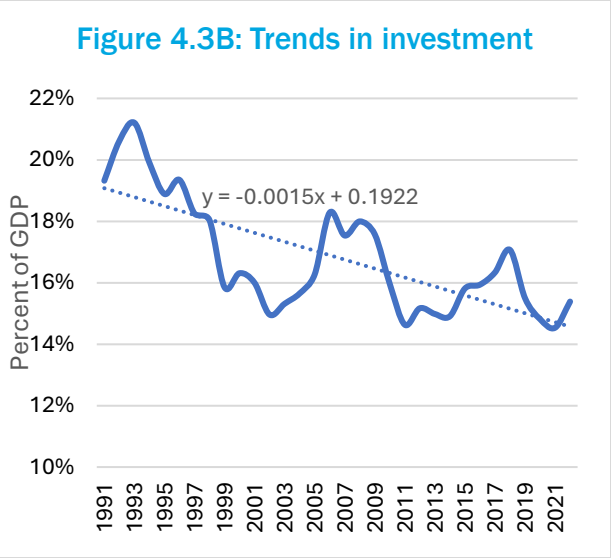
Figure 4.3: Trends in number of consumers

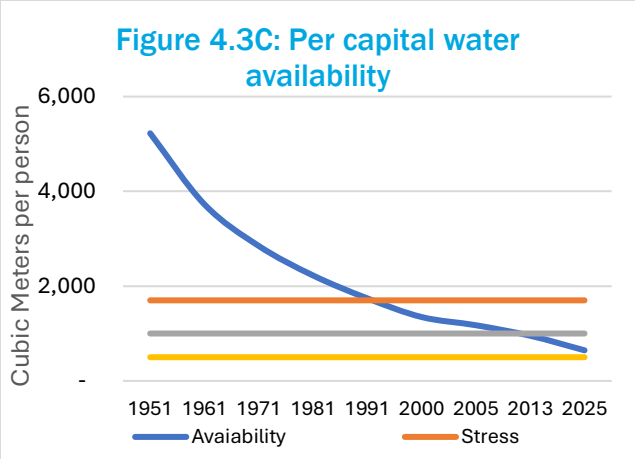


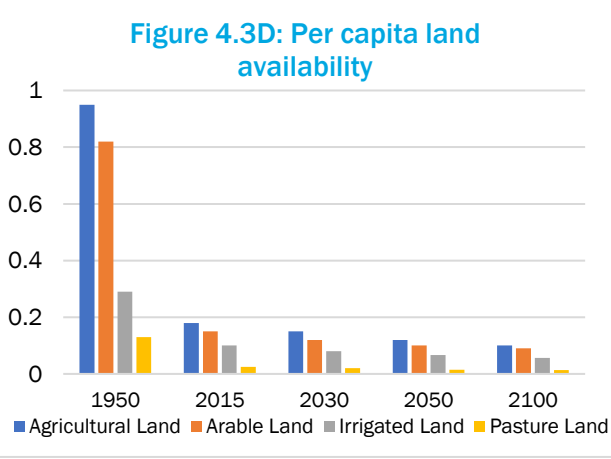
In addition, the rapid population growth may exacerbate resource scarcity, such as water shortages in Pakistan, which are fast approaching absolute scarcity (Figure 4.3C). Similarly, the per capita availability of agricultural, arable, irrigated, and pasture-land has declined drastically, threatening the country's food security.

[10] Later in this section, we will challenge even the unmitigated positivity of the second effect.





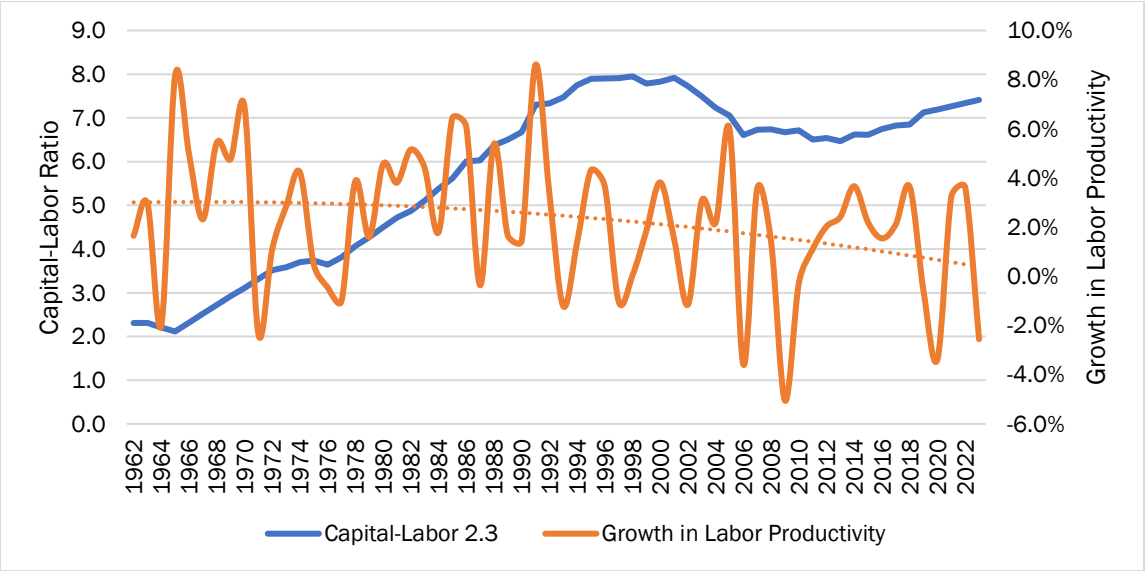




Pathway II—Capital Shallowing Effect: The second pathway linking population growth to economic development involves labor productivity. As capital accumulation slows down due to lower savings, there is a reduced level of capital per worker (i.e., capital-labor ratio). A high capital-labor ratio is generally associated with greater labor productivity, so a decline in this ratio implies a decline in labor productivity.

In Pakistan, the capital-labor ratio continued to increase up until the mid-1990s. However, it declined between 1995 and 2014 and has started to increase again (Figure 4.4). Meanwhile, labor productivity growth shows significant year-to-year variation but an overall declining trend. This, along with a sharp decline in total factor productivity (likely due to a lack of investment in modern technology and innovation), best explains the overall economic slowdown.

Figure 4.4: Trends in labor productivity and capital-labor ratio



Labor productivity issues can be further illustrated by comparing productivity in Pakistan with that of India and Bangladesh. Figure 4.5A shows that even by 2005, Pakistan's labor productivity was 33% higher than India's and 40% higher than Bangladesh's. At that time, India had about the same capital-labor ratio as Pakistan, while Bangladesh's ratio was about half of Pakistan's. Because of much higher levels of investment, by 2019, India's capital-labor ratio was 130% higher than Pakistan's, while Bangladesh's ratio was 3% higher (Figure 4.5B). In Pakistan, the human capital element, as measured by the average years of schooling of workers, has consistently been lower than in the other two countries. Over time, the education gap with India widened, while it remained the same with Bangladesh despite a drop in schooling years in Bangladesh in 2014 (Figure 4.5C).

Figure 4.5A: Trends in labor productivity

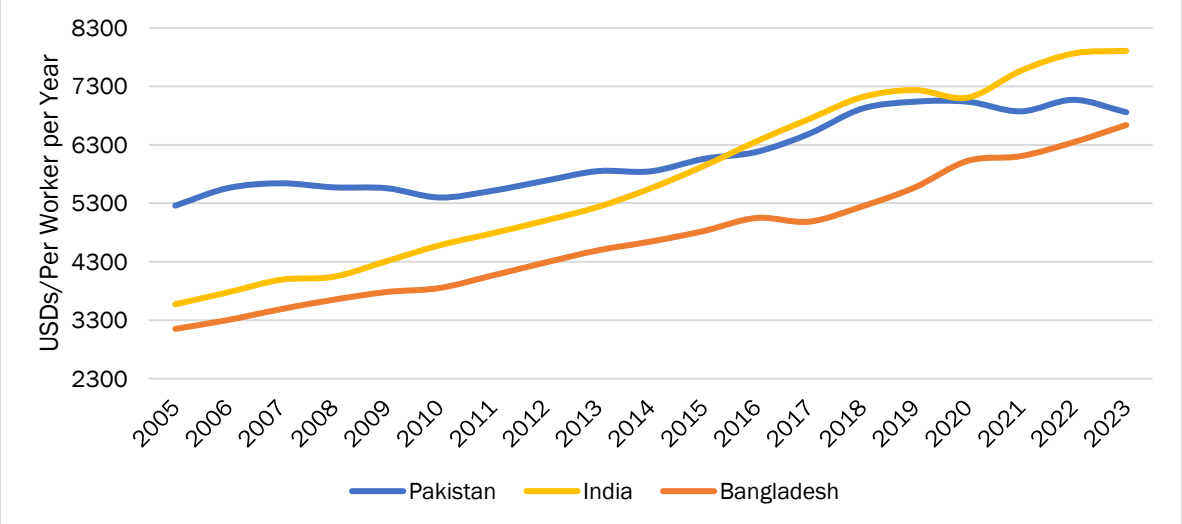


Figure 4.5B: Capital-Labor ratio

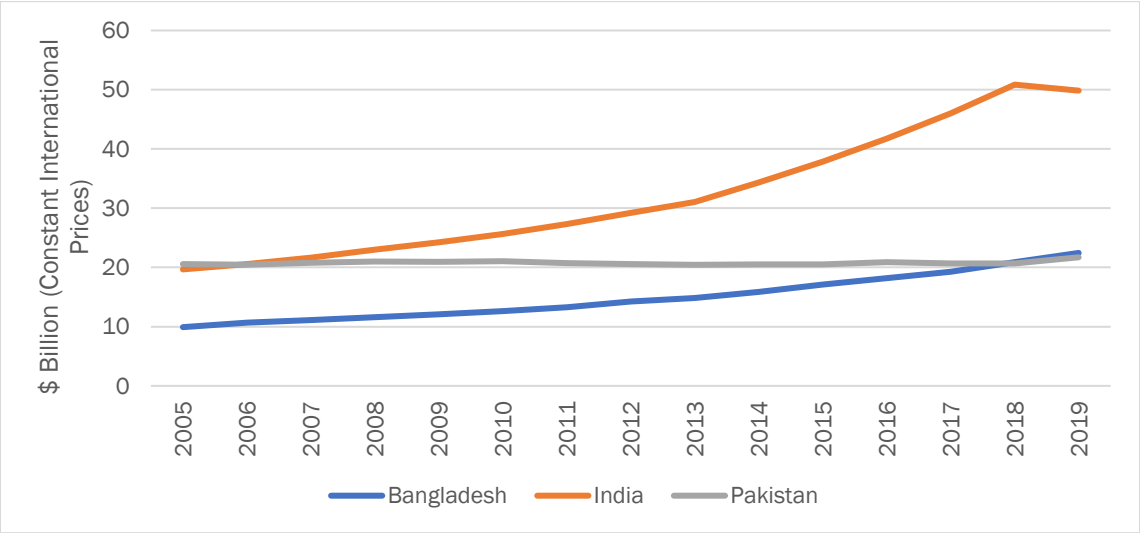
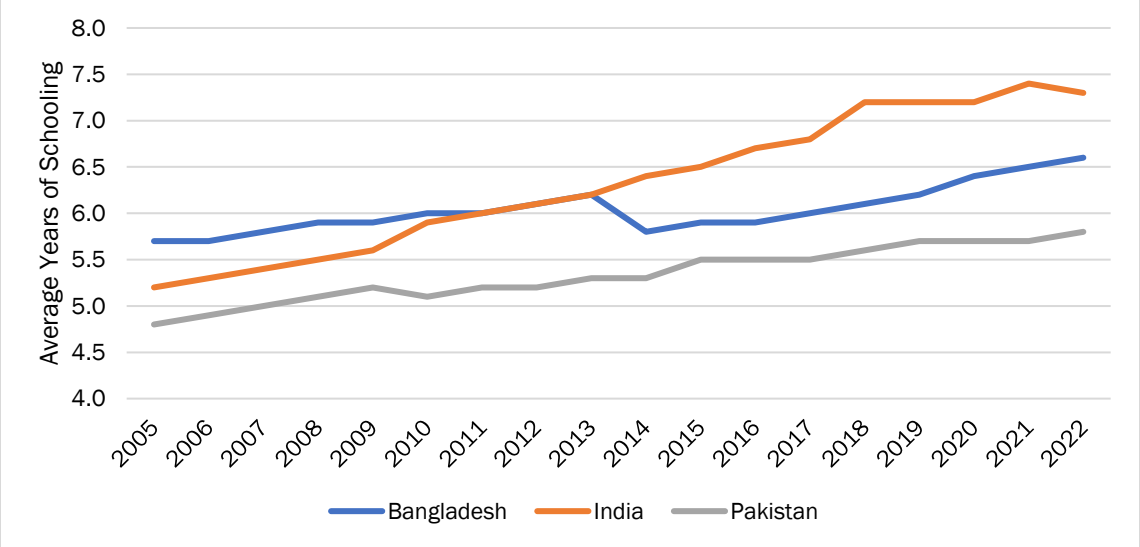
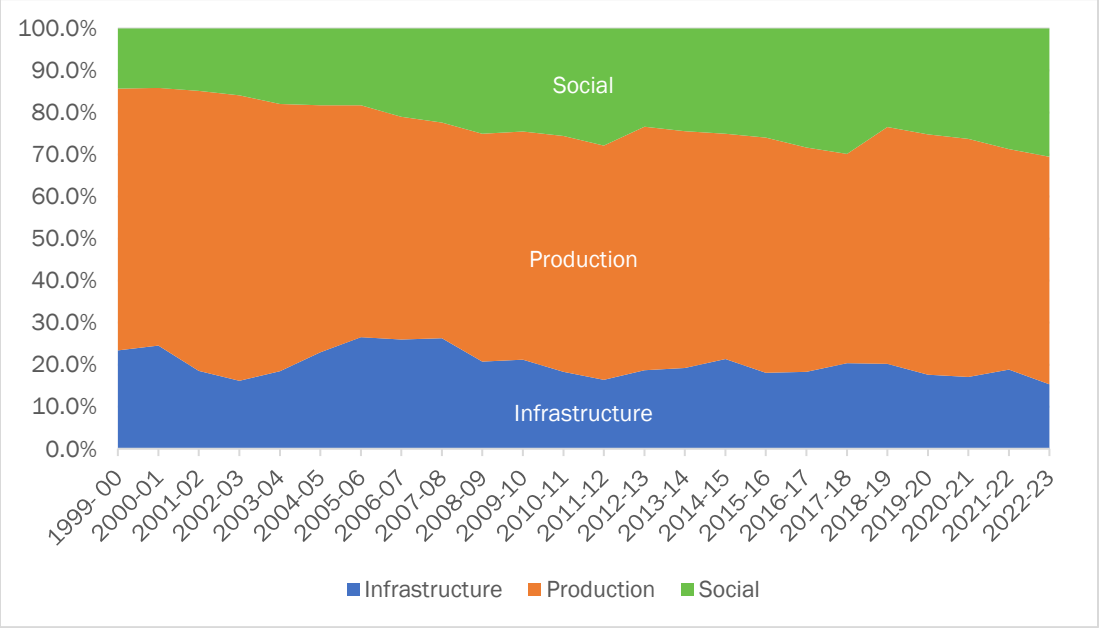


Figure 4.5C: Workers' education



Pathway III—Investment Diversion Effect: Rapid population growth generates a strong demand for government expenditures in areas such as social safety nets, education, health, food security, etc. thereby diverting funds from relatively more productive, growth-oriented public and private investments. Even if one considers the above expenditure heads as investment in human capital, there is an obvious diversion of investment from shorter-gestating physical capital to longer-maturing human capital, which has at least a short-run effect on economic growth. We have already seem that in Pakistan, overall investment has a declining trend. Looking solely at the trend in total investment in Pakistan, it becomes very clear that the share of social sectors in this investment has increased steadily (from 14% in 1999–2000 to 31% in 2022–2023), while the shares of infrastructure and production sectors have declined.

Figure 4.6: Share of infrastructure, production, and social sectors in total investment



Pathway V—Labor Diversion Effect: The presence of small children in a family makes it difficult for the parents, especially the mother, to work full-time, as she has to spend a considerable portion of her daily time looking after, caring for, and nurturing the children. In other words, labor force participation, particularly of females, is adversely affected by the presence of small children in the family. In Pakistan, the female participation rate (FLPR) has been significantly lower than that of India and Bangladesh (Figure 4.7A). However, since 2000, as India's economic growth soared, the female labor force experienced a sharp decline. This so-called "income effect" caused India's FLPR to drop by 10% (1,000 basis points), falling below that of Pakistan's. Figure 4.7B provides strong evidence that Pakistan's FLPR is, at least partly, due to its high rate of population growth, which has kept the proportion of children in the family (proportion of population of up to 4 years in total population) relatively high.

Figure 4.7A: Female labor force partcipation rates

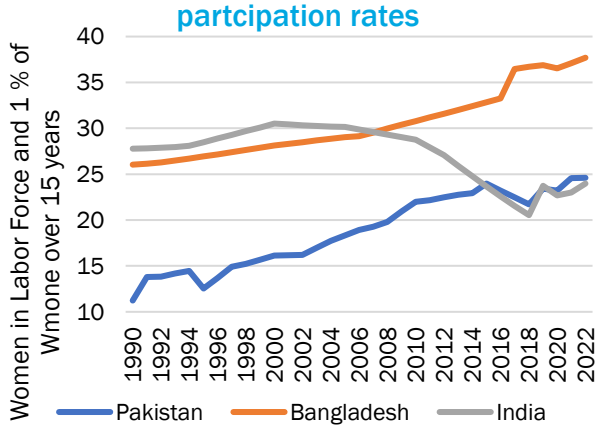
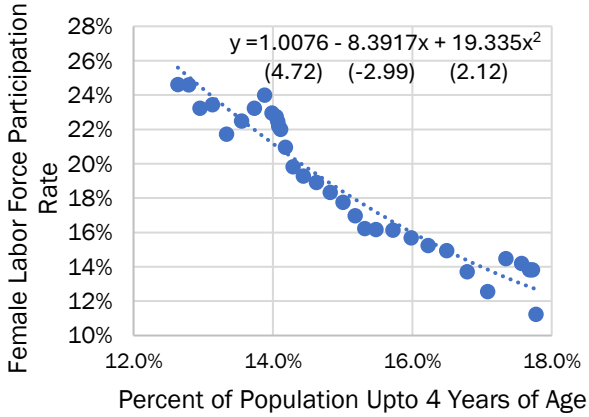


Figure 4.7B: Relationship between FLPR and population up to 4 years



Pathway VI—Dependency Effect: A corollary of the Labor Diversion effect is that rapid population growth leads to a high ratio of children to working adults (i.e., age dependency), implying that each additional child leads to a greater decline in a household's per-capita income than in per-capita consumption, thereby reducing per-capita (and overall) household savings. Pakistan's declining savings rate (Figure 4.3A) can be seen, at least in part, as an outcome of this dependency effect.

Pathway VII—The Fiscal Stress Effect: Pakistan's tax faces numerous challenges. To add to that, the economic slowdown and the rapidly growing population have pushed many households below the tax threshold limit, leading to smaller growth in tax revenues. In contrast, the growing population has increased the need for expanding and maintaining public infrastructure (electricity, gas, water supply and sanitation, roads, irrigation, telecommunication, railroad, etc.) and services (education, health, social safety nets, etc.), causing a sharp rise in public expenditure. As a result, fiscal deficits have ballooned, requiring expenditure cutbacks. Since expenditure rigidities leave very little room for cutting non-development expenditures, the development budget bears the brunt of fiscal adjustment,[11] thereby adversely impacting economic growth.

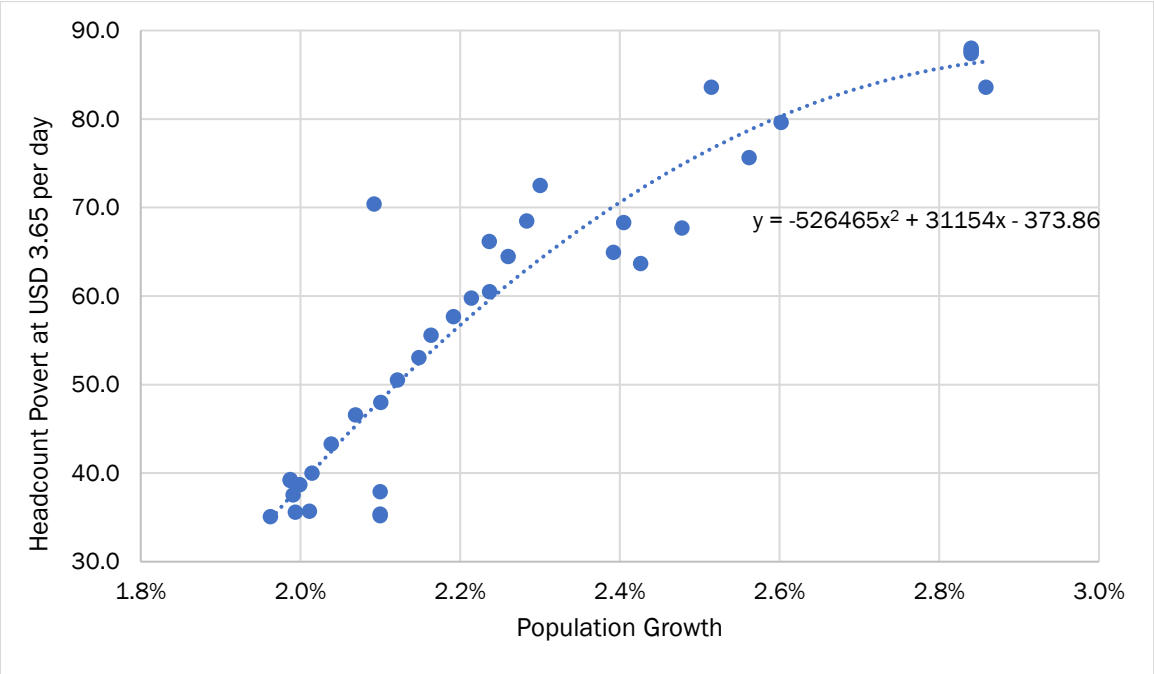
Pathway VII—Environmental Degradation Effect: Besides the aforementioned shortages, the rapidly growing population leads to environmental degradation. The need to produce enough food for this growing population has led to the use of unregulated chemicals, adversely impacting the quality of drinking water. In addition, a large amount of untreated human waste is being dumped into water channels, explaining the spread of waterborne diseases in the country. Similarly, solid waste produced in urban centers has exceeded the financial and management capacity of civic organizations. Even in an ideal situation, managing all the waste produced by the large and fast-growing population would require substantial public resources, which would need to be redirected from other, perhaps more productive, uses.

Population Growth and Poverty

All the above-mentioned factors combine to impact poverty levels in the country, directly or through economic deceleration. Although poverty in Pakistan has been falling sharply, despite the economic slowdown and its weak economic and social indicators, a strong positive correlation between poverty and population growth cannot be denied theoretically or empirically (Figure 4.8).

[11] The sharp decline in overall investment is partly due to a fall in government's development spending.

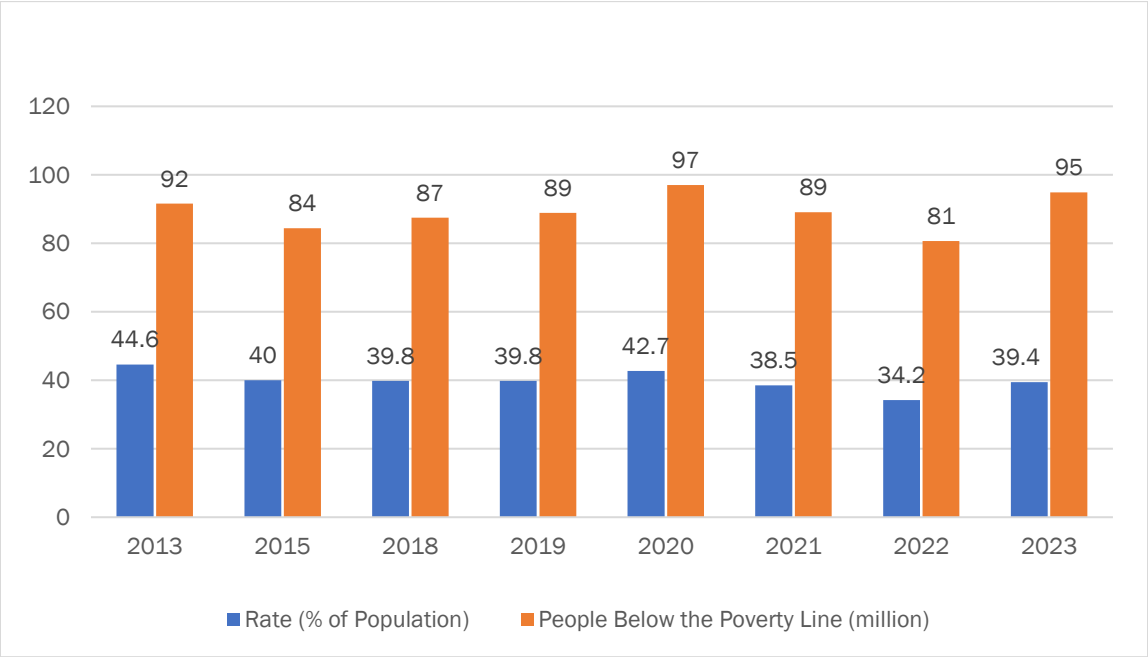
Figure 4.8: Relationship between population growth and poverty



These seemingly paradoxical statements highlight two important facts. First, notwithstanding Pakistan's remarkable performance in reducing poverty against all odds, the performance would have been even stronger if the rate of population growth had been somewhat lower. Second, even with a sharp reduction in the poverty rate, the number of people below the poverty line remains high. Figure 4.9 shows that between 2013 and 2023, poverty in Pakistan declined by over 500 basis points (from 44.6% to 39.4%), yet the number of persons below the poverty line was 3 million higher in 2023 than in 2013. As seen in Figure 9, due to a sharp economic slowdown in recent years, even the rate of decline in poverty has decelerated. In fact, in 2023, the poverty rate was almost 500 basis points higher than in 2022, implying that a poorly performing economy has pushed another 14 million people below the poverty line.

Although the economy is expected to recover in the immediate future, this recovery is likely to be slow and will remain vulnerable to various internal and external shocks. Therefore, the improvement in reducing poverty rates is also expected to be slow and fraught with risks. If the population growth remains as stubbornly high as it has been in the recent past, the number of poor people in the country will continue to increase. Assuming no significant changes, a continuation of this situation for another 25 years (until 2058) would imply a decline in the poverty rate to about 25%, but an increase in the poor population (i.e., below the poverty line of US$3.65 per person per day) to over 117 million. The economic and social consequences of such a large poor population should be evident to everyone, most importantly to policymakers.

Figure 4.9: Poverty trends in Pakistan (at $3.65 per person per day)



From the above discussion, it is clear that while there are many factors explaining Pakistan's present macroeconomic problems, most of them are linked to its inability to reduce population growth. One macro-level factor requiring urgent attention is the complete abdication of population responsibility by the federal government, even though there are some inherent structural biases against effective delivery of population services at the provincial level (see Box 1).

Given the adverse impact of high population growth on the social fabric and economy of the country, the federal government should take a more active role in reducing the population growth rate without infringing on provincial sovereignty as defined by the 18th Amendment. This could involve setting targets and standards for population services and providing provinces with additional financing based on their needs and performance in effectively delivering of population services.

Section III

Relationship Between Population and the Economy: Evidence from Household Data

For any population policy to be meaningful and successful, it must consider not only the macro implications of rapid population growth, which are relatively easy to analyze, but also focus on the micro effects of such growth. A population policy will appeal to the target population only if it is expected to have some positive impact on wellbeing at the family level.

A necessary, although not a sufficient, precondition for the success of a population policy is that a minimally decent level of living be ensured. At very low levels of income, which generally characterize the main target group of any population policy, limiting family size may seem subjectively irrelevant or even inadvisable. Thus, a certain level of economic development, ensuring at least full subsistence for the populace, is necessary if a population policy is to be successful in any country.

In economically advanced countries as well as in the least developed countries, demographic analysis has generally focused on the macro implications of population growth and little on the micro effects that occur at individual or household levels. The socio-economic costs, in individual or household terms, of rapid population growth tend to be chronic as well as severe. A micro-analytic approach to population study, seeking to show how additional population pressure arises and impinges on the welfare, goals, opportunities, and behavior of the family, is largely absent—even though two facts are well recognized in the literature: first, the population explosion is a manifestation of a crisis in the family as an institution; and second, this crisis often results from the inability of human relations within the family to adapt to fundamental and pervasive economic changes.

Recent research by economists suggests that, for the most part, growth cannot be explained solely by the classical theories that focus on increases in the traditional inputs of capital, land, and labor. According to these theories, output per worker should eventually decline as the population grows. However, the so-called “residual”—that part of economic growth that cannot be explained by increases in traditional inputs—accounts for most of the economic growth that takes place. According to Kuznets (1960), no more than 10% of the growth rate in a number of European countries, Australia, and Japan can be accounted for by traditional inputs. In most cases, neither capital nor labor of the existing quality has been the major force in the growth process. Instead, the acquisition of various qualities at the family level, through sustained nurture and both formal and informal education, significantly affects the welfare of the family and the nation’s development momentum.

Despite these realizations, discussions about the relationships between family size and its effect on all aspects of family welfare are rare in existing economic literature, except for some scattered evidence available here and there. The primary mode of analysis has involved inferences about output based on the impact of population growth on the ratios of traditional inputs like land, labor, and capital. The effects of a large family on food and nutrition, clothing, housing, sanitation, health facilities, education, and energy consumption are prime indicators of living standards that have rarely been analyzed, especially in less developed countries such as Pakistan. Yet, the effects of a

population explosion are much more chronic and severe at the micro level than at the macro level. The present chapter aims to highlight some of the consequences of large family size on its wellbeing.

Using household survey data, this section will attempt to answer the first three questions. Figure 10 outlines some of the estimated[12] relationships between the household size and different socio-economic variables.[13]

Dependency Ratio (Chart A): Defined as a ratio of non-earning to earning members in the household, the relationship shown in Chart A reveals that the dependency ratio increases with household size, supporting the neo-Malthusian postulate. The increase, however, declines as household size increases. At the average household size of 5.85 persons, the ratio increases by 0.55 for a one-person increase in household size. In other words, the dependency ratio rises from 0 for single-person households to over 4 for households of 10 persons or more. This occurs because, as the household size increases from 1 to 10 or more, the number of earners increases from 1 to 3.2, while the number of non-earners increases from zero to over 12.

Household Income (Chart B): Income increases with household size, albeit at a declining rate. This increase in income is mainly due to two factors: the number of earners in the household and the household's average age. The number of earners rises from an average of 0.6 for a single-person household to 3.2 for households with 10 or more members. Larger households are generally older, implying that earners in these households are likely to be more experienced and settled in their jobs/trades, earning more than earners in smaller households. The declining rate of income increase with household size indicates that per capita income decreases as household size grows. This resource dilution is the most important pathway through which household size impacts the household economy and wellbeing. In our case, a one-person increase from the average household size causes a monthly increase in household income of Rs 3,847 (9.5%). However, this increase is much smaller for larger households.

Household Consumption (Chart C): Like income, household consumption shows an increasing trend (at a declining rate) with household size. This supports the revisionist assertion of economies of scale in household consumption, where some commodities function as household public goods[14] that can be shared without being duplicated in proportion to the number of household members. Hence, household expenditure rises with each additional member, but at a decreasing rate. These household public goods reduce the average cost of an increase in family size, depending on their significance in household consumption. Nonetheless, the relationship shows that per-capita consumption declines as household size grows.

[12] Log linear regressions were estimated, except for household savings which has some negative numbers, and thus a semi-log relationship was estimated. However, in Figure 4.1, the actual values of the variables were plotted against the household size. The same relationships in per capita terms are given in Annex I.

[13] Care should be taken in interpreting the results from charts in Figure 4.10 as these two-dimensional charts show a two relationship. In reality, ach of the dependent variable shown in these charts could be impacted by additional variables, which can alter the magnitude of the relationship with family size.

[14] The examples of household public goods include almost all of the durable goods and the "hand-me-down" items, like clothes, toys, books, etc.

Household Savings (Chart D): This chart reveals one of the most interesting and important relationships: it shows that the actual level of household saving (as opposed to the saving rate or per-capita saving, which declines at much steeper rates) declines with an increase in household size. Household savings for a single-person household average about Rs 22,000 per month, but for households with a size of 8.3 or higher, monthly savings turn negative, indicating that larger households are dissaving (or divesting) to finance their consumption. An average-sized household of (5.85 persons) has a monthly saving of Rs 4,063. A one-person increase in household size causes this saving to drop by Rs 1,683 p.m. (41%), implying a lower potential to accumulate physical and financial assets among the larger families compared to smaller households, which in turn affects future income potential.

Households' Food Expenditure (**Chart E):** One area of expenditure that is unlikely to contain any element of household public good is food. Moreover, food is typically non-substitutable with other consumption items, especially for poorer households whose income and, therefore food consumption, is already close to subsistence level. This suggests that if per-capita income is held constant, food consumption per head should rise with household size. However, chart E shows a decline in per-capita consumption as household size increases. Two effects underlie this relationship. First, as per capita income decreases with household size, so does food expenditure. Second, households may substitute "high quality" with "low quality" options as economic conditions (e.g., a drop in per-capita income), reducing food expenditure among larger households. This has significant implications for the nutrition level in these families, especially affecting children's development (leading to stunting and/or wasting) and making them more vulnerable to various health problems.

Housing Expenditure (Chart F): Similar to savings, household expenditure on rent and housing decreases as household size increases. As household per-capita economic resources decline with household size, housing becomes a "luxury" good that is sacrificed to maintain the consumption levels of "necessities" (e.g., food, clothing, etc.). Poor quality housing also has implications for household wellbeing, particularly in terms of health.

Figure 4.10A–F: Relationship of household size with different economic factors

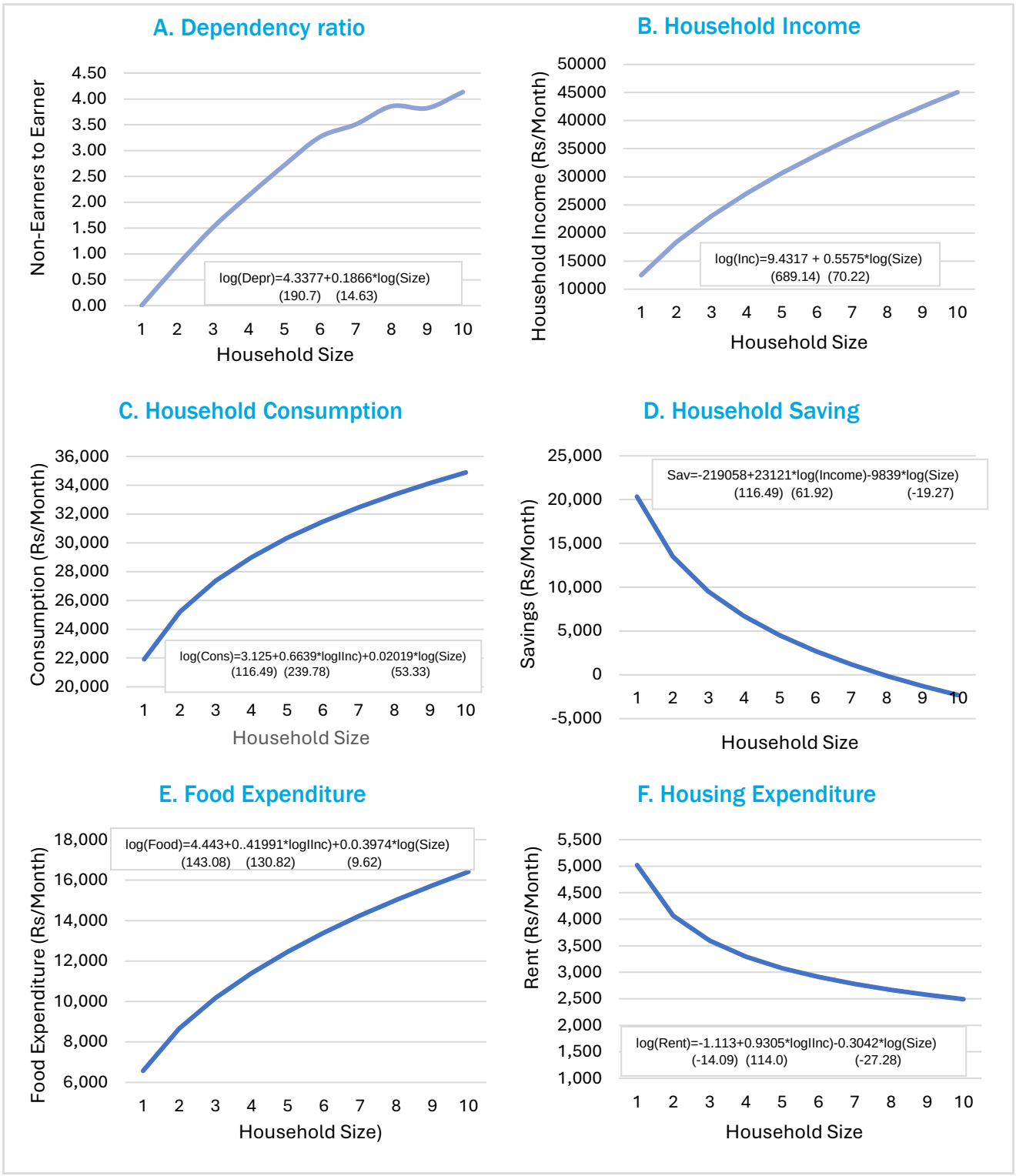
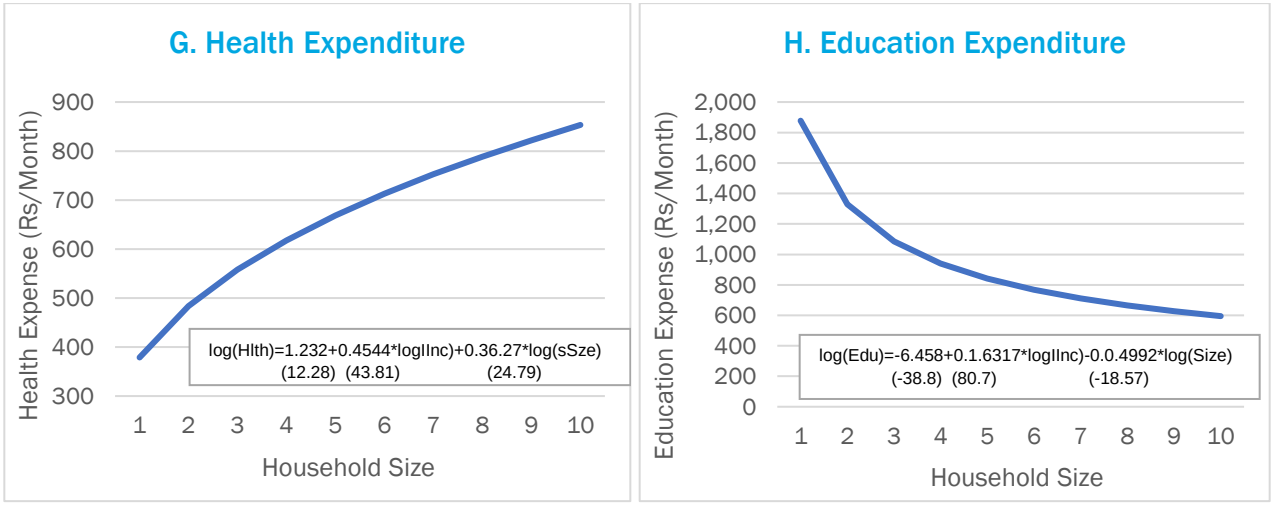


Figure 4.10G–H: Relationship of household size with different economic factors

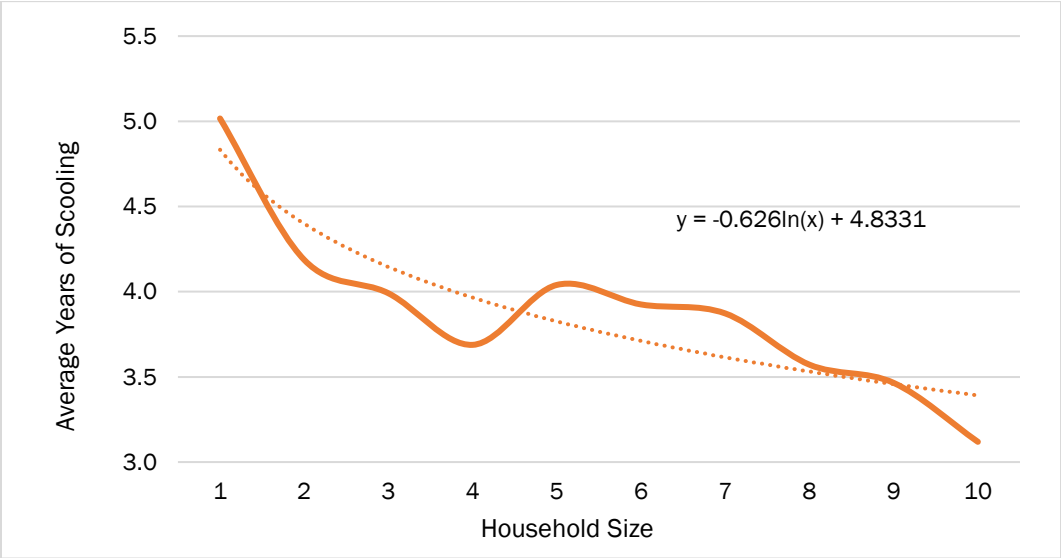


Health Expenditure (Chart G): A household's health expenditure increases with an increase in household size, giving health a "necessity" status in household consumption preference. However, this status is likely to be forced upon the household. As indicated above, larger households are likely to face more health problems than smaller households. Increased incidence of disease not only leads to greater morbidity but also results in higher levels of health expenditure in larger households.

Education Expenditure (Chart H): Perhaps the most surprising and concerning finding from the analysis of household expenditure is that expenditure on education declines with household size. In other words, education is viewed as a "luxury" by households, and therefore needs to be reduced when per-capita income drops, allowing the household to channel its declining resources towards more "essential" expenditures. However, this result seems less surprising, albeit still alarming, when viewed from a household's work-income-consumption perspective. As per-capita income declines with an increase in household size, non-working members may be forced to seek employment, including adult females and even children. As mothers go out to supplement household income, elder children, especially girls, often take on the responsibility of caring for younger siblings and helping with household chores. Children may also be required to engage in income-earning activities, leading to them being withdrawn from school. As is the case with other "luxury" items, a lower level of education expenditure may involve quantity-quality switching where, with a decline in per-capita income, parents in larger households may opt for lower-quality education for their children.

Given the complexities associated with the relationship between household size and education expenditure, an attempt is made to investigate a direct relationship between household size and average years of schooling. The relationship was found to be significantly negative (Figure 4.11), indicating that human capital is compromised more in larger households than in smaller families. This has serious implications for the future economic and social wellbeing of these households.

Figure 4.11: Average years of schooling



Household Size's Effect on Ownership of Consumer Durables

Figures 4.10B to 4.10H reveal the effect of an increase in household size on household income, consumption, savings, and various household consumption items. It is therefore important to assess the impact of household size on the acquisition behavior of consumer durables, which, in some way, could be considered household assets.

Table 4.1 shows the average probability of a household owning a particular durable good, while the marginal probability indicates the change in the probability of acquiring the good with a one-person increase in household size. Table 4.1 reveals that over 90% of households in the sample own some sort of electric fan, whereas less than 2% of households own a tractor. Looking at the marginal effects, the table shows that out of 17 consumer durables analyzed, an increase in household size (by one individual) has a positive effect on the ownership probability of 5 goods (sewing machine, motorcycle, bicycle, radio, and tractor), with the highest increase in ownership probability observed for the motorcycle (0.78%). For the remaining 12 durable goods, an increase in household size has a negative impact on their ownership, with stoves, refrigerators, and air conditioners showing significant declines in ownership probabilities.

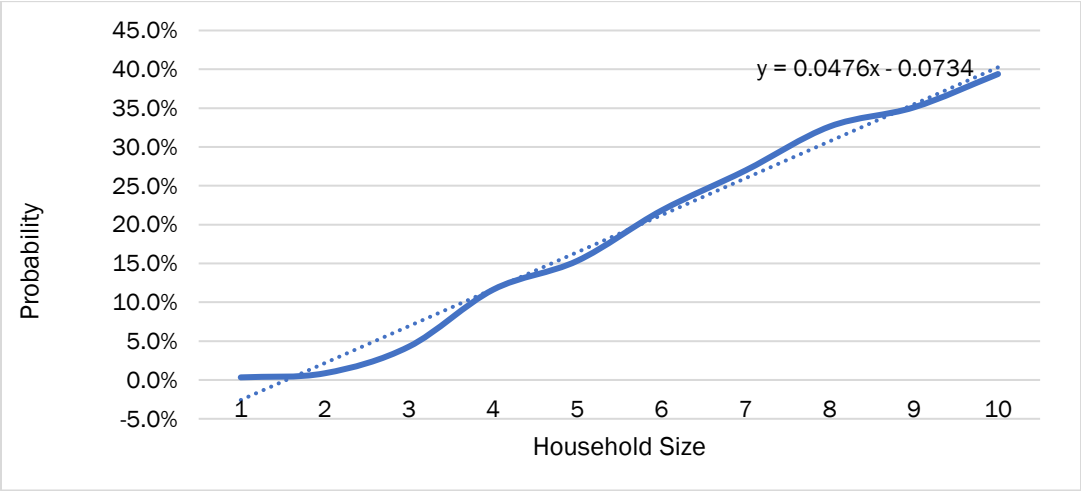
Table 4.1: Probability of owning consumer durables

	Probability of Owning	
	Average	Marginal
Fan	90.18%	–0.69%
Iron	77.61%	–1.36%
Sewing Machine	57.77%	0.35%
Stove	52.54%	–3.25%
Television	50.49%	–1.49%
Motorcycle	50.40%	0.78%
Refrigerator	47.63%	–2.47%
Air Cooler	11.25%	–0.86%
UPS	9.77%	–1.61%
Bicycle	9.14%	0.61%
Heater	8.97%	–1.27%
Microwave Oven	7.22%	–1.89%
Geyser	6.86%	–1.43%
Air conditioner	6.68%	–2.47%
Car	5.39%	–0.91%
Radio	3.82%	0.50%
Tractor	1.87%	0.07%

Household Size and Poverty: Given all the adverse effects detailed above, it becomes essential to investigate the relationship between household size and poverty using household survey data. As expected, the relationship was found to be positive (Figure 4.12). The probability of a typical one-person household being poor is negative, whereas that of a 10+ member household is close to 40%.[15]

[15] This probability increases by almost 5 percent with every single person increase in household size.

Figure 4.12: The probability of household being poor



Section IV

The Cost of Inaction

The Cost of High Population Growth

There are various demand- and supply-side factors responsible for Pakistan's poor performance in reducing its population growth rate, including widespread poverty, cultural barriers, gender disparities, governance and administrative issues in the delivery of population services, inadequate financing for these services, and more.

Although some people may continue to be in denial, the empirical evidence presented above seems irrefutable: the high rate of population growth has contributed to Pakistan's declining economic fortunes. To illustrate the losses to the country from failing to manage its population growth, we build a hypothetical scenario that estimates what macroeconomic aggregates might have looked like had Pakistan better managed its population growth.

A study conducted for the IMF in 1968 (Zaidan) showed that due to its rapidly rising population, Pakistan required USD 680 million (in 1964 prices) each year just to maintain its per-capita income. Adjusting this amount for the decline in the rate of population growth since 1968 and accounting for the change in the price base from 1964 to 2015–2016, the required amount would now be around USD 80 billion annually (or 20% of the present GDP).

To further elaborate on the result of the IMF study, let's assume that starting in 1968, with a more effective population program, Pakistan was able to reduce its population growth by 0.5% (50 basis points) from its actual level by 1978. We also assume that since 1978, the population growth rate would have followed its actual trend. In other words, from 1978 to 2023, Pakistan's population growth rate would have been 0.5% lower than what was actually achieved. This implies that in 2023, the population growth rate would have been 1.4% rather than the current level of 1.9%. The cumulative effect of lower population growth over 55 years would mean that in 2023, Pakistan's total population would have been only 184 million—56 million less than today.

This reduction in population growth would have generated a series of positive effects on the economy. Foremost among them is the decline in the dependency ratio, which would drop from the present 2.4 to about 2. This, combined with lower consumption needs, would lead to a 6% increase in the savings rate as a percentage of GDP on average (Figure 4.13). This increase in savings would, in turn, boost investment by an average of 7% of GDP, causing the GDP growth rate to rise to 5.6% per annum, compared to the present average of 4.7% (Figure 4.14). The outcome of this sustained higher rate of economic growth would be that real GDP today would be 56% higher than its actual level, and per-capital GDP would be double the current level (Figure 4.15).

Figure 4.13: Trends in actual and estimated saving rate

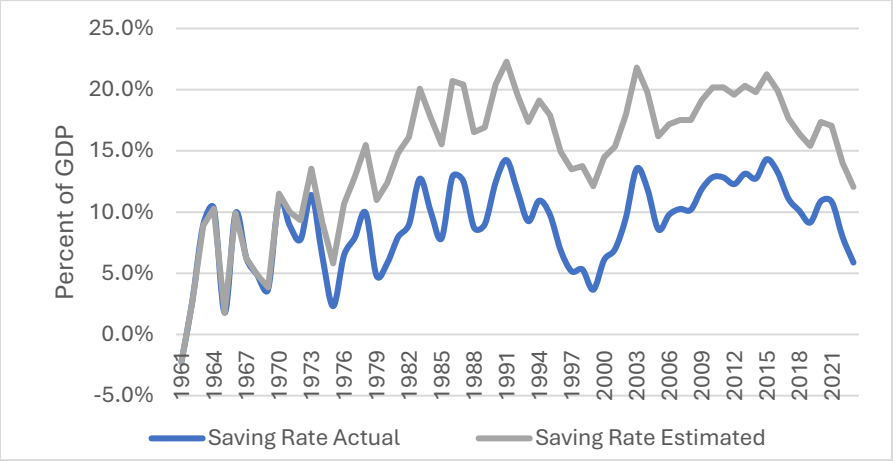


Figure 4.14: Actual and estimated investment rates

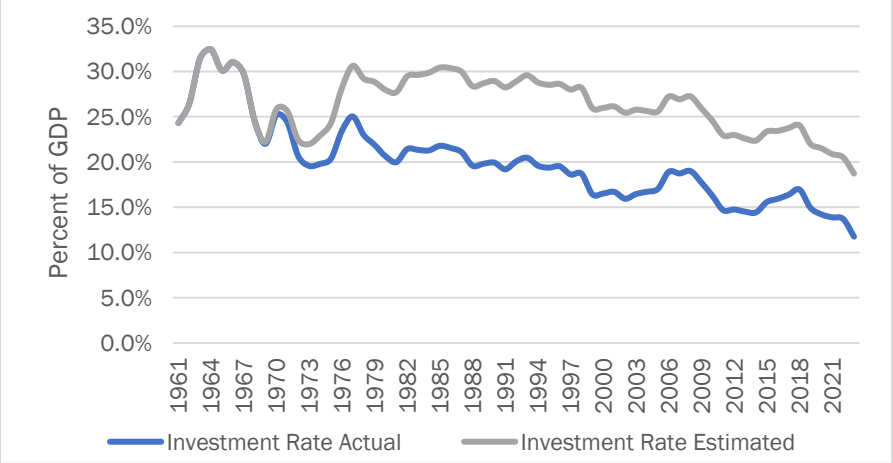
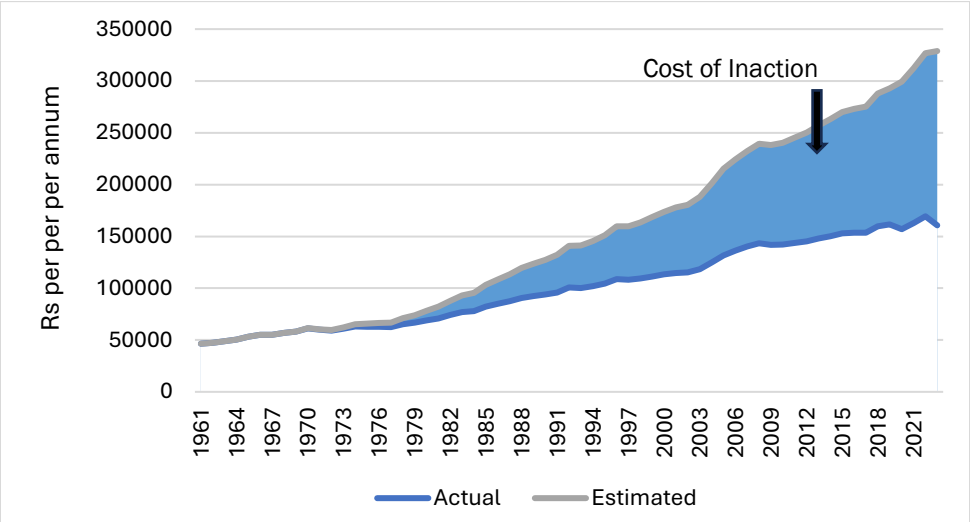
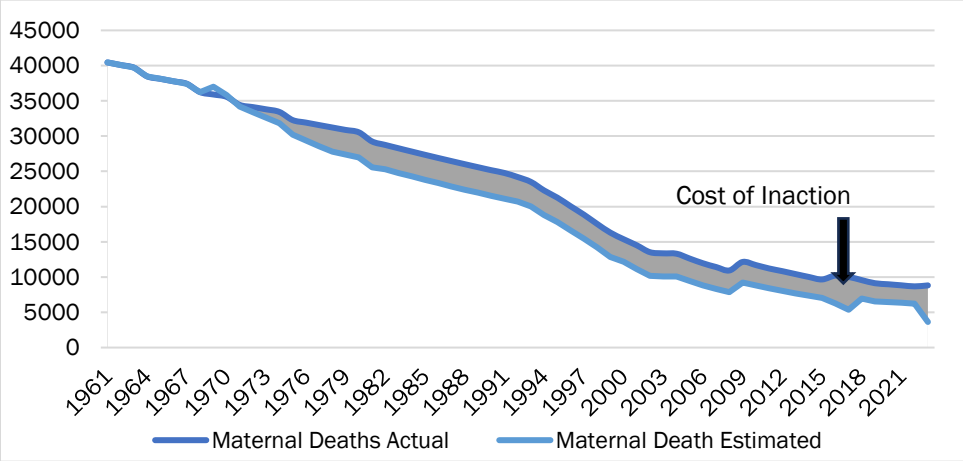


Figure 4.15: Trends in actual and estimated per capita GDP



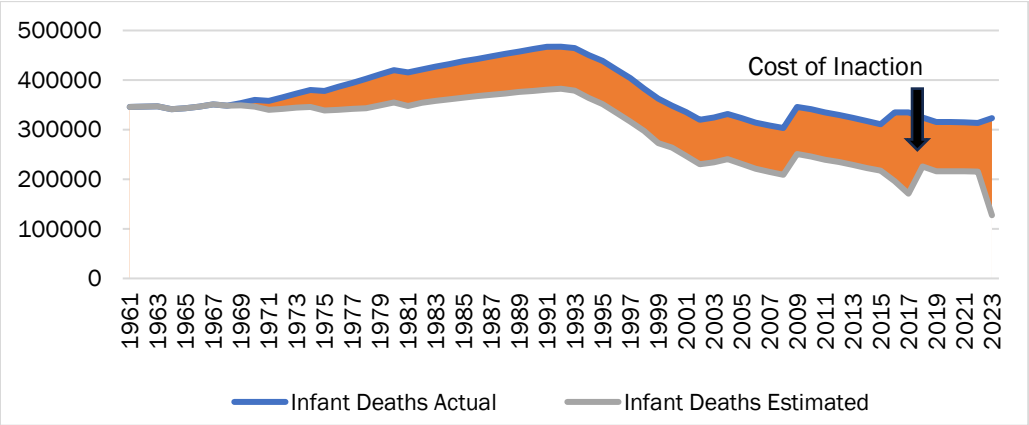
Pakistan, at present, has one of the highest maternal mortality rates in the world. This is partly a reflection of inadequate access to and quality of Pakistan's healthcare system, poor nutritional levels, and insufficient pre-natal knowledge and hygiene among expectant mothers. However, it is also a consequence of the large number of pregnancies and ill-spaced births. A more effective population program would have reduced fertility rates, resulting in fewer lifetime pregnancies and births. This alone would lead to a significant reduction in maternal mortality (Figure 4.16). As shown in Figure 16, due to falling birth rates, maternal deaths today could have been reduced by more than 5,000 from their current numbers. Cumulatively, over the last 55 years, 162,000 mothers' lives could have been saved solely through a decline in fertility rates.

Figure 4.16: Trends in maternal deaths, actual and estimated



Similar to maternal mortality, infant mortality rates are also very high in Pakistan, largely for the same reasons. Under the assumptions of a more effective population program, many of these infant deaths could have been prevented solely by reducing the conception rate (Figure 4.17). Although these babies might not be alive today, the avoidance of associated emotional, psychological, and economic costs (both to households and the government) could be significant.

Figure 4.17: Trends in infant death, actual and estimated



In addition to the expenses mentioned above, there are also costs related to poor household health associated with a growing population, environmental degradation, and other societal impacts. The cumulative cost, both to families and the nation as a whole, would be substantial.

Projecting the Economic Benefits of Reducing Population Growth Rates

To project the economic benefits of reducing population growth rates, a simple macroeconomic simulation model is developed for the 2023–2050 period.

The starting point of the model is a production function:

1. Log(GDP) = α_0 + α_1 log(Emp) + α_2 log(Inv)
2. Inv = Sav + Imp – Exp
3. Log(Sav) = β_0 + β_1 Log(GDP) + β_2 log (Pop)
4. Emp = LPR*Pop – Uemp

Where:

- GDP = real GDP (at constant (2015-16) market prices)
- Emp = Employment level
- Inv = real (in 2015-16 prices) investment
- Sav = real (in 2015-16 prices) savings
- Imp = real (in 2015-16 prices) imports
- Exp = real (in 2015-16 prices) exports
- Pop = Population
- LPR = Labor-force participation rate
- Uemp = Unemployment level

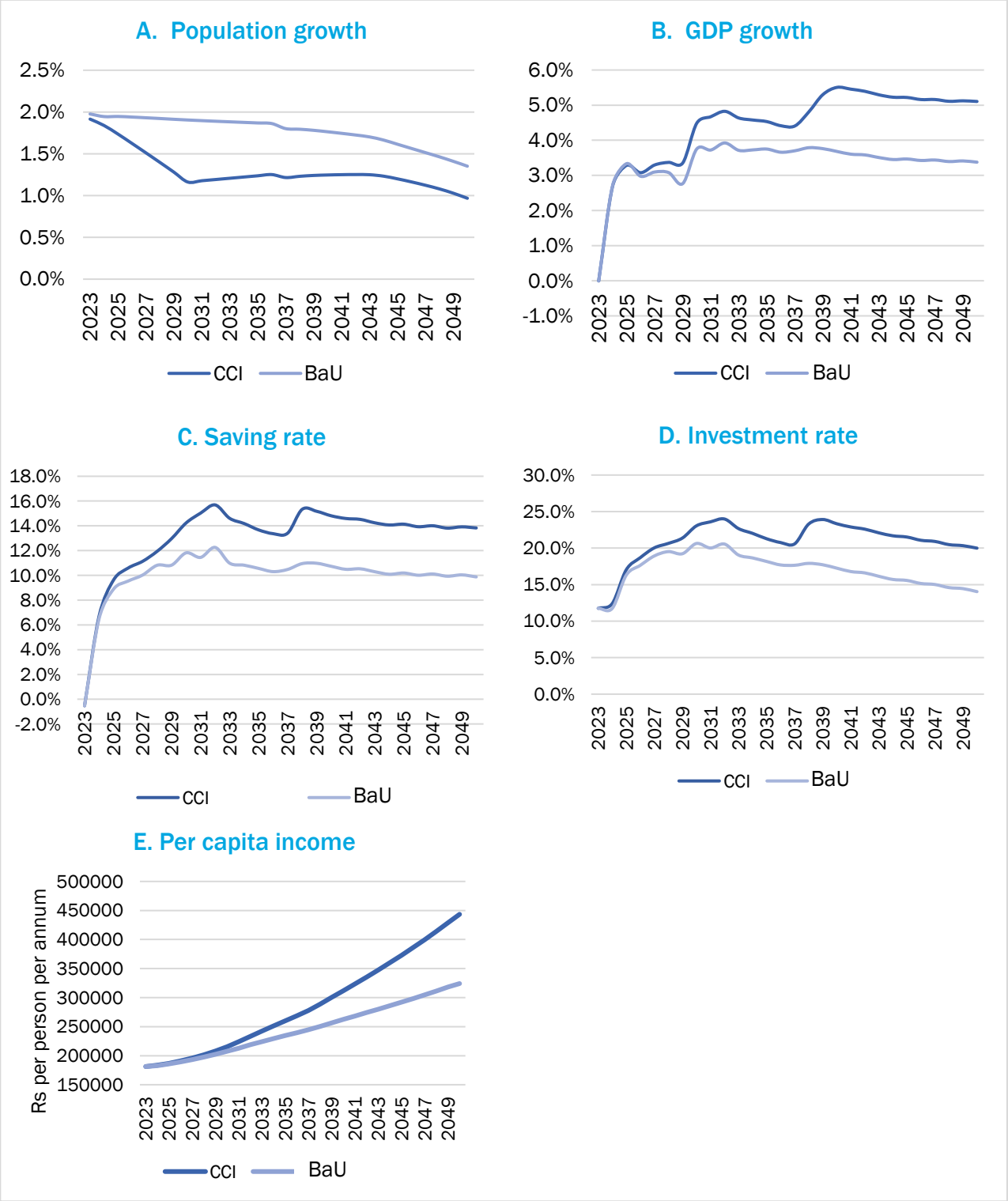
Under the assumption that population (and population growth), real exports and imports, and the labor-force participation rate are exogenously determined, we can use this simple four-equation model to simulate the effect of population on GDP.[16] We use three different simulation scenarios to

[16] One advantage of a double-log specification is that the effect of population on GDP gets mirrored to the effect of population growth on GDP growth. The TSLS estimates of the two structural equations are as follows:

Log(GDP) = 10.3993 + 0.0791*Log(EMP) + 0.4518*Lpg(INV) + 0.0499*TIME
[9.77]** [0.68] [7.33]** [8.255** R-squared:= 0.9957
log(SAV) = -2.17723 + 0.762*log(GDP) - 0.365*log(POP) + 0.472*log(SAV(-1))
(-4.31) (7.51) (-3.35) (6.20) R-squared = 0.999

determine the trends of key economic variables from 2023–2024 to 2049–2050. These trends are presented in Figure 4.18.

Figure 4.18: Trends in key economic variables under different reform scenarios



Scenario I: "Business-As-Usual" (Population Council Baseline Population Projections). Under this scenario, the economy follows its natural trend without any additional effort to reduce the rate of population growth. The total fertility rate (which was estimated at 3.5 in 2023) is assumed to decline along its natural trend, falling by an average of 0.04 children per married woman of reproductive age each year until 2050 (for details see chapter 3 of this volume by KC et al., 2024). As a result, the population growth rate will decrease from 2% per annum in 2013 to 1.4% by 2050.

Although no economic and/or structural reforms are implemented, the economy shows some improvement in the near future, due partly to successful past stabilization measures taken by the authorities, partly because of the base effect, and partly due to decreasing population growth—which boosts national savings and correspondingly investment in the country. A decline in population growth, relatively faster growth in GDP, and a favorable base effect cause the saving rate to increase sharply, reaching 12.8% of GDP by 2040. Subsequently, due to slowing economic growth and an unfavorable base effect, the saving rate tapers off, reaching 11.9% of GDP by 2050.

The rise in the saving rate positively affects investment, increasing the investment rate from 11.8% in 2013 to 14% in 2032. Due to the low initial base, better saving and investment rates, and slower population growth, GDP growth improves, reaching 3.9% per annum by 2032. However, as the base effect begins to limit future growth, the rate gradually declines to 3.4% per annum by 2050.

Scenario II: Effective Population Policy (CCI Target). Under this scenario, the government prepares and implements a population policy aiming to achieve the population target agreed at the Council of Common Interest (CCI) meeting. This plan focuses on "low-hanging fruits" to yield immediate results. As a result, the fertility rate drops sharply, from 3.5 children in 2023 to 2.2 children in 2030, leading to a decline in the annual population growth rate from 1.8% to 1.2% during this period (for details see chapter 3 of this volume by KC et al., 2024). Subsequently, population growth slows to reach 1% in 2050, compared to 1.4% in the "Business-As-Usual" (BaU) scenario (Figure 4.18 A).

After 2030, the decline in population growth slows as the unmet demand is almost fully addressed. Throughout the projection period, the population growth rate remains lower than in the BaU scenario. Consequently, the saving, investment, and GDP growth rates are all higher than in the BaU scenario. The largest difference is observed in the investment rates, which, under the CCI scenario, will be 650 basis points higher than in the BaU scenario by 2050. The GDP growth will be higher by only 170 basis points due to the base effect limiting economic growth more than it does for savings and investment (Figures 4.18B, C, D).

Higher GDP growth and remittances, combined with lower population growth, will result in significantly higher per capita income under the CCI scenario compared to the BaU scenario. The average growth in per capita income under the CCI scenario (3.4% per annum) is significantly higher than under the BaU scenario (2.2% per annum). By 2050, the per capita income under the CCI scenario will be 37% higher than in the BaU scenario. This difference in per capita income growth implies that headcount poverty levels under the CCI scenario are likely to be significantly lower than under the BaU scenario.

Conclusion

Pakistan's economy is currently facing serious challenges. These challenges stem mainly from decades of economic mismanagement and failure to make the right decisions at the right time. This includes the reluctance to take decisive action to curb the rapid growth in population. Reasons cited for this hesitation range from population planning being in conflict with religious and social values to the belief that population itself is an economic resource. While we do not claim expertise on the former issue, the analysis in this chapter unequivocally refutes the latter argument, at least in Pakistan's context.

The chapter demonstrates that a population can be considered an economic resource only if each additional person added to the labor force produces more output than they consume. In other words, average labor productivity must exceed average consumption. This requires sufficient saving and investment rates, enabling the country to accumulate enough capital and technology to achieve the desired level of labor productivity.

In Pakistan's case, the saving and investment rates are abysmally low. As a result, labor productivity has been on a continuous decline. Consequently, the country is trapped in a cycle where high population growth leads to a high dependency ratio, leading to low savings, which in turn results in low investment, low labor productivity, and low economic growth—further exacerbating the problem of low savings rate and perpetuating high population growth.

Until the 1990s, Pakistan avoided this cycle from becoming explosive by securing sizable and relatively large and inexpensive foreign resources. However, these resources have become increasingly scarce and costly, intensifying the country's challenges. The chapter suggests that the most effective way to break this vicious cycle is to reduce population growth.

Realizing this, the Council for Common Interest in 2018 agreed on the need of moving more aggressively to contain population growth. The target set was to increase the contraceptive prevalence rate from 34% in 2017 to 60% in 2030. This increase is expected to reduce the fertility rate from 3.6 children per married woman to 2.2 and the population growth rate from 2.4% per annum to 1.1%.

As shown in the analysis, meeting this target could trigger several positive developments that, over time, could transform the current vicious cycle into a virtuous one. Lower dependency ratios could lead to increased saving and investment rates (commonly called the economic dividend), thereby enhancing GDP growth.

Higher economic growth could also reduce the pressure on public services, particularly education and healthcare, allowing for improvements in their quality. These improvements, in turn, could boost human capital and productivity in the country.

The government's past inadequate response to the growing population has incurred significant economic and social costs, which cannot be undone. The critical question for policymakers and those addressing population issues is whether the country can afford to continue bearing these costs in the future. As highlighted by the analysis, these costs are increasing over time.

Moreover, the country is already grappling with serious economic, social, political, and security issues. Adding a growing population to these challenges is neither necessary nor advisable. Better population management may be the most effective and cost-efficient solution to many of Pakistan's economic problems.

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CHAPTER 5

Migration, Urbanization, and Structural Transformation in Pakistan

G.M. Arif

Introduction

Currently, more than half of the world's population (56%) live in cities or in urban settlements. By 2050, it is projected that 70% of the global population will live in cities (World Bank, 2023). The urban population of Asia is expected to increase by 61% and that of Africa is likely to triple, so that by 2050, most of the world's urban population will be concentrated in Asia (52%) and Africa (21%) (UN, 2018). In Pakistan, the most urbanized country in South Asia, it is projected that by 2050, more than half of its total population will reside in urban areas.

Urban transition represents "a shift in a population from one that is dispersed across small rural settlements, in which agriculture is the dominant economic activity, towards one that is concentrated in larger and denser urban settlements characterized by a dominance of industrial and service activities" (UN, 2018). This shift typically leads to a structural transformation of the economy, moving from low-productivity, labor-intensive activities to higher-productivity, capital-, and skill-intensive activities. However, in many developing countries, urbanization has occurred without this structural transformation towards manufacturing and services. The result is uncontrolled urban growth with low levels of productivity and quality of life. Globally, one-third of urban residents currently live in slums or informal settlements. In Pakistan, 40 percent of urban residents live in such conditions, where uncontrolled urbanization poses significant risks to development and improved living standards (Castells-Quintana and Wenban-Smith, 2019).

The Sustainable Development Goals (SDGs) address urbanization in SDG-11, which aims to "make cities and human settlements inclusive, safe, resilient and sustainable." Targets related to this goal include providing adequate housing for all by 2030, developing efficient transport systems and infrastructure, promoting inclusive and sustainable urban planning and management, protecting and safeguarding cultural and natural heritage, reducing disaster-related deaths, minimizing the per capita environmental impact of cities (including attention to air quality and municipal and other waste management), and providing universal access to green public spaces, especially for women, children, the elderly, and persons with disabilities (Aslam, 2022). Achieving these targets would reduce the risks associated with of uncontrolled urbanization. The New Urban Agenda (NUA), which is universal in scope, participatory, and people-centered, outlines a long-term vision, priorities, and actions that governments and stakeholders can adopt based on their needs, with a strong focus on inclusion, innovation and integration.

Historically, rural-to-urban migration played a key role in urban transition and economic development in Europe and more recently in China, where it significantly contributed to high economic growth since the early 1990s. The increase in urban labor supply due to rural-to-urban migration, along with the emergence of private enterprises, absorbed migrant workers and fueled economic expansion (Wang and Conesa, 2022). However, in many developing countries today, urbanization is primarily driven by natural population increase—the balance between births and deaths—rather than migration, resulting in demographic pressures in rural areas with declining and deteriorating living conditions (Bocquier et al., 2023; Castells-Quintana, 2019).

Pakistan has a long history of internal migration within the country as well as international migration across borders. It is the most urbanized nation in South Asia. While natural population increase (births/deaths) remains the primary driver of urban growth in Pakistan, internal migration, particularly rural-to-urban migration, and reclassification, contribute significantly, accounting for about 30% of urbanization. Urbanization in Pakistan has largely been unplanned, rising exponentially over the past 25 years (Safdar, 2018). Basic services for urban residents, including shelter, transport, education, jobs, healthcare, water, and energy are often considered inadequate (Kugelman, 2013). On the other hand, cities are seen as key drivers of revenue, GDP growth, and employment opportunities—from small and medium enterprises, which provide the majority of Pakistan's nonagricultural jobs, to high-growth industries like information technology (Kugelman, 2013).

This background raises several critical questions about Pakistan's structural transformation:

- What changes have occurred over time in three key sectors of the economy: agriculture, manufacturing, and services?
- What is the current status of internal migration in Pakistan, particularly from rural-to-urban areas? What roles do migration play in urbanization?
- Is urbanization in Pakistan occurring rapidly, without adequate planning or structural transformation?
- Can Pakistan, with a population of 240 million, achieve the SDG-11 targets for most, if not all, of its population by 2030?

The main objective of this study is to understand the nexus between migration, urbanization, and structural transformation in Pakistan, focusing on the mobility of labor from low-productivity rural sectors to high-productivity urban sectors such as manufacturing and services, as well as the implications of demographic transition.

Migration, Urbanization, and Structural Transformation: A Conceptual Framework

There is a growing body of literature on the structural transformation of a society and the economy in the context of migration and urbanization. The concept of "sustainable urbanization" is closely related, defined as "the transition of rural-urban landscapes that structure both rural and urban economy, ecology, and society in ways that reward the present generation with higher quality of life

but without endangering and diminishing the living standards of future generations" (Un-Habitat, 2016). The primary drivers of this structural shift or transition are labor-push and labor-pull factors (Jedwab, 2013).

For example, a rise in agricultural productivity, such as a green revolution, reduces food scarcity and releases labor to the modern sector. Meanwhile, increased non-agricultural productivity, such as industrial growth, attracts underemployed agriculture workers into modern sectors, leading to greater non-agricultural employment and urban employment. This structural shift often results in higher productivity, improved living standards, and a better quality of life, with cities evolving into centers of change and innovation (UN-Habitat, 2016).

However, in many developing countries, urbanization has occurred without a corresponding structural transformation towards modern sector employment (manufacturing and services). In Africa, for instance, urbanization and structural transformation are often disconnected. The region's urbanization did not stem from a green or industrial revolution but resulted mainly from natural resource exports—creating "consumption cities" with limited manufacturing and tradable service sectors. Such cities tend to have a minimal impact on long-term economic growth due to their low productivity. The result is an uncontrolled growth of cities (Castells-Quintana and Wenban-Smith, 2019).

A recent study by Xu et al. (2023), using augmented ARDL analysis, found that while urban transition in Pakistan positively impacts economic growth in the short term, it negatively affects growth in the long term due to the predominant role of agriculture, which is considered the backbone of the Pakistani economy. The shift from rural-to-urban migration may lead to over-urbanization, making it unsustainable as urbanization continues. The growth of slum areas particularly in Pakistan's larger cities, indicate issues of "unplanned urbanization."

Dumont (2018) offers a perspective of "urban demographic transition" that moves beyond the notions of over-urbanization or unplanned urbanization. He identifies three factors that drive the increase in urban population. The first is the decline in mortality rates, particularly among infants, children, and women during childbirth, which improves survival and life expectancy for city and town dwellers, thereby increasing the urban population. Second, environmental conditions improve more rapidly in cities and towns than in the countryside, with faster progress against poor sanitation. The concentration of people in urban areas facilitates the development and profitability of infrastructure and services that can quickly reduce mortality. The third factor is linked to rural-urban migration, driven by the modernization of agriculture and the perception of cities as offering more opportunities and greater support from the political authorities. However, these expectations often lead to disappointment.

Structural transformation is considered successful when agriculture, through higher productivity, not only meets food needs but also supplies surplus labor, skills, and even savings for urbanization and industrialization. A robust agricultural sector raises labor productivity, increases wages, and gradually reduces absolute poverty. The process diminishes agriculture's relative importance in the economy as industrial and service sectors expand, partly due to the modernization of agriculture and the migration of rural workers to urban jobs (UN-Habitat, 2016; Wang and Conesa, 2022). Migration

plays a crucial role in all aspects of development (Foresti et al., 2018), with structural transformation also involving a demographic transition to lower birth and death rates, driven by improved health standards in developed and urban areas.

This concept of structural transformation aligns with the SDG agenda for sustainable urbanization—making cities and human settlements inclusive, safe, resilient, and sustainable. According to Wolfram (2016), this transformation requires enhancing urban transformative capacity, defined by "the collective ability of the stakeholders involved in urban development to conceive of, prepare for, initiate, and perform path-deviant change towards sustainability within and across multiple complex systems that constitute the cities they relate to." Wolfram further argues that effective transformation calls for diverse, flexible, and robust governance structures that build legitimacy, trust, knowledge, and political leverage. Three critical factors include: wide participation and active stakeholders participation; diverse governance modes and networks (decentralized/centralized, formal/informal, multi-level, etc.); and c) the presence of effective intermediary organizations and individuals between sectors and domains.

The conceptual framework for this study draws on the experiences of successful structural transformation experiences, aligning with SDG targets and the New Urban Agenda (NUA). It adopts the UN-Habitat's framework for the convergence of urbanization and structural change (UN-Habitat, 2016). Structural transformation in the context of migration and urbanization involves shifting from low productivity, labor-intensive activities to higher productivity, capital- and skill-intensive activities. This long-term transition impacts economic growth and development, comprising several key components:

- A declining share of agriculture in GDP and employment
- Rural-to-urban migration underpinned by rural and urban development
- The growth of a modern industrial and service economy
- A demographic transition from high to low birth and death rates
- Enhanced urban transformative capacity involving stakeholders in urban development

This framework highlights the importance of integrating job creation, livelihood opportunities, and quality-of-life improvements (such as housing, transport, healthcare, and education)—emphasizing inclusive stakeholder participation and diverse governance approaches.

Methodology and Data Sources

This study examines the structural transformation of society and the economy through four key dimensions: 1) trends in agriculture growth and changes in its contribution to GDP and employment, 2) the growth of industrial and service sectors in Pakistan, 3) rural-to-urban migration patterns, and (4) demographic transitions in both rural and urban areas. The phenomenon of international migration (and return migration) has also been examined, particularly to assess whether it can be considered, at least in part, a demographic dividend, as it provides employment opportunities for youth, generates much-needed foreign remittances, and brings home workers with new skills.

Migration is considered a household decision in this study. Internal migrants are defined as "inter-district lifetime in-migrants," individuals who have moved from one district to another after birth and intend to reside in their current location for more than six months. This concept is applied in population censuses and household surveys in Pakistan. The lifetime migration concept has several limitations; for example, it ignores all movements that occurred between birth and the time of the survey. Another significant limitation is the omission of intra-district mobility, which is a major driver of urban growth, particularly for small and medium-sized cities. However, the inter-district lifetime in-migration concept remains a simple and relatively straightforward method for measuring internal migration.

The analysis focuses primarily on rural-urban migration due to its direct relevance to urbanization and societal transformation, building upon the discussion of migration presented in chapter 2 of this volume by Bashir et al. (2024). The out-migration module of the 2017–2018 Pakistan Demographic and Health Survey (PDHS), which tracks the mobility of household members over the 10 years preceding the survey, is utilized in this study. The importance of overseas migration of Pakistani workers to society, the economy, and affected households is well-established. International migration includes those who went abroad for employment through the Protector of Emigrants and registered with the Bureau of Emigration and Overseas Employment (BEOE). Another category of international migrants consists of those who went abroad for permanent settlement or long-term visas (such as student visas), primarily to the UK, North America, Australia, Europe, and China, without registering with the BEOE. The study analyzes both temporary overseas workers and permanent settlers. Return migrants are defined as those who have left the district or country for work, residence, or study abroad and have since returned home.

This study uses the administrative definition of ''urban," as applied in the census data. For urbanization projections, it relies on UN-generated data. Recent studies have assessed the contributions of rural-urban migration, natural growth, and reclassification to urban growth (Arif et al., 2023). This data supports the study's argument that urbanization in Pakistan is primarily driven by natural population increases, as is the case in other developing countries. The issue of "unplanned urbanization" is analyzed in two ways: 1) adequacy of urban housing, and 2) the growth of unregulated settlements or *katchi abadis*.

Data from multiple sources have been used to address the research questions, primarily 1) Population censuses 1951, 1961, 1972, 1981, 1989, 2017, and 2023; 2) Pakistan Demographic and Health Survey (PDHS) 2017–2018; 3) Pakistan Social and Living Standards Measurement (PSLM) Survey 2019–2020; and 4) Pakistan Labour Survey 2021–2022. Migration statistics from the 2023 population census have not yet been released. Data on GDP growth, overseas labor migration, and remittances are regularly reported in Pakistan Economic Surveys, reports of the State Bank of Pakistan, and on the BEOE website.

Sectoral Growth and Contribution to Employment, 1950–2024

As highlighted in the conceptual framework, two essential components of the structural transformation are: 1) the declining share of agriculture in GDP and employment, and 2) the rising share of the modern industrial and services sectors. These sectors of an economy have varying capacities to generate employment. In the case of Pakistan, as in many other developing countries, the services sector is the largest contributor to employment in urban areas, while agriculture remains the primary driver of employment in rural areas. The capacity of the industrial sector is much lower than that of the services sector. This section examines the growth of Pakistan's three main economic sectors—agriculture, manufacturing, and services—and their contribution to GDP and employment over the period from 1950 to 2024 to provide context for rural-urban migration, urbanization, and structural transformation.

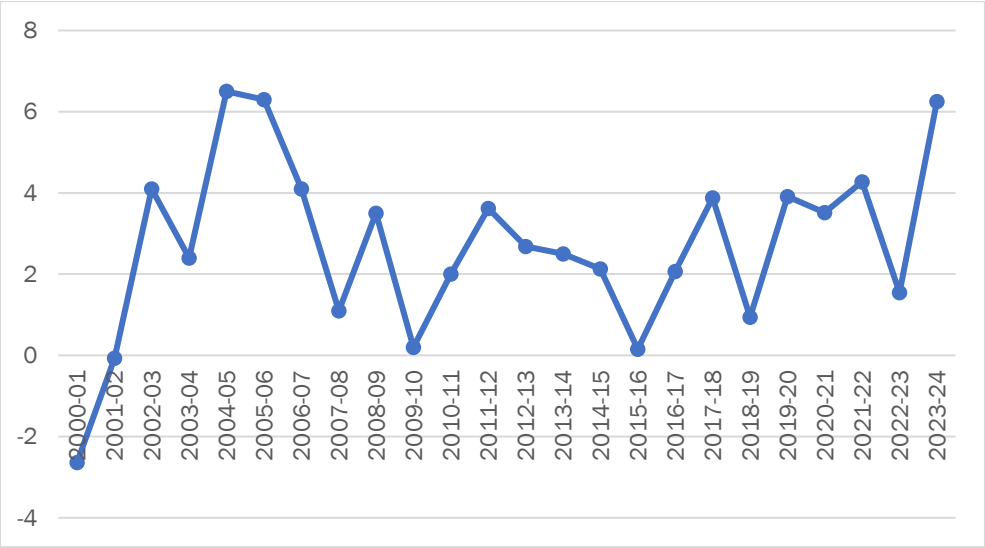
Agriculture Growth, GDP, and Employment

A vibrant agricultural sector, which provides food and surplus labor through higher productivity, is essential for the structural transformation of society and the economy. Historically, Pakistan's agricultural sector has been regarded as the backbone of the economy and has been extensively researched. To understand its role in the structural transformation of the society and the economy, we can focus on four integrated dimensions: long-term agriculture growth, productivity, its share in GDP, and its share in employment.

Pakistan's agricultural sector maintained a long-term growth rate of more than 3% per annum between 1949–1950 and 1996–1997. However, according to Chaudhry and Chaudhry (1994), this growth pattern was patchy. Agricultural growth in the 1950s and 1960s was driven by factors such as the availability and use of irrigation water (resulting from an agreement with India), the introduction of productivity-enhancing fertilizer-seed packages, the installation of tubewells, and rural electrification, and policy changes that improved the profitability of farming (Faruqee, 1999).

During the early 1970s, the annual growth rate in agriculture plummeted to a historically low level of 0.78% due to uncertainties created by land reforms (and their selective implementation) in 1972 and 1977, severe climatic shocks, a cotton virus that depressed production for much of the decade, and political instability (Faruqee, 1999). Since the 1980s, livestock and non-cereal crops have become the main drivers of agricultural growth. Despite this, growth rates declined in the 1990s and were even negative at the beginning of the new millennium (Figure 5.1). Despite this, the agricultural sector saw growth rates of more than 6% during 2004–2005 and 2005–2006. Since 2007, according to Husain (2023), agricultural growth has averaged only 2%, largely due to rapid growth in non-crop sectors such as dairy, livestock, and poultry. Strong growth of more than 6% has been reported for the current fiscal year, 2023–2024. Overall, the growth pattern of the agriculture sector over the past seven decades has been irregular.

Figure 5.1: Annual agriculture growth (%), 2000–2024



Source: Pakistan Economic Survey.

It has been argued that food output must grow at an annual rate of 5.0% to achieve food self-sufficiency on a sustainable basis (Chaudhry and Chaudhry, 1994). The average annual growth rate exceeded this required growth rate during the 1960s and was close to it between 1984–1985 and 1989–1990. More recently, the growth surpassed 5% in 2004–2005 and 2005–2006, and the current fiscal year (Figure 5.1). However, due to the low growth rate for most other years, food availability has remained a serious issue, often managed through wheat imports, which contributed to inflation. According to the 2019 State Bank Report, Pakistan lags behind other lower-middle-income countries in all four dimensions of food security, including food availability. With a rapidly growing population and changing consumption behaviors, food imports have steadily increased, exacerbating the already stressed balance of payments. Limited (if any) attention has been given to the local production of minor crops and livestock produce, such as pulses, fruits, vegetables, nuts, and oilseeds, which contribute around 50% of dietary energy and play a crucial role in nutritional food security (State Bank of Pakistan, 2019).

Low agriculture productivity remains a significant challenge. Total factor productivity (TFP)[17], a key measure of productivity, has been declining since 1998, with gains mainly benefitting large farmers while small and medium farms[18] have experienced a significant decline. TFP now accounts for less than one-fifth of the sector's growth. A modest 10% increase in wheat yields could boost national output to 30 million tons, which would be sufficient to meet the domestic consumption needs and eliminate the need for imports (Husain, 2023).

[17]TFP reveals the joint effects of many factors including new technologies, efficiency gains, economies of scale, managerial skill, and changes in the organization of production. TFP index is defined as the ratio between an Output Index (i.e. the change in production volumes over a considered period) and an Input Index (the corresponding change in inputs/factors used to produce them).

[18] Chaudhry and Chaudhry (1994) argued that the small farms have maintained an edge over the large farms in the growth of land productivity between 1965-66 and 1995-96.

Higher agricultural productivity generally leads to a reduced share of agriculture in GDP, as surplus labor from agriculture shifts to more dynamic sectors of the economy, accelerating overall growth. In Pakistan, the share of agriculture in GDP declined from 42% in 1960 to 22% in 2022, with little change over the past decade and a half (Figure 5.2). In contrast, India's agricultural share in GDP is decreased to 16% from 60%—yet the country produces 323 million tons of food grains and exports $50 billion worth of agricultural commodities. Per capita food availability in India has risen by 11% over the last seven years, primarily due to higher productivity in the agriculture sector, even though land and water resources did not increase proportionately (Husain, 2023). Productivity improvements are essential to address future challenges related to urbanization, demography, and climate change in Pakistan.

As Saeed (2023) notes:

> The features of Pakistan's agriculture sector today demand mechanization. The low yields per acre and small scale of farming operations lead to inefficient use of resources and higher unit costs. This means higher end-consumer prices despite low farmer profitability. The lack of modern drying, storage, and logistics infrastructure means higher post-harvest losses of commodity and the use of bags for grain storage and transport entails high labor costs. All this means higher costs for end-consumers. Finally, growers continue to lack the capacity to adopt better farming practices which are complemented by modern technology.

Figure 5.2: Agriculture share in GDP (%), 1960–2022

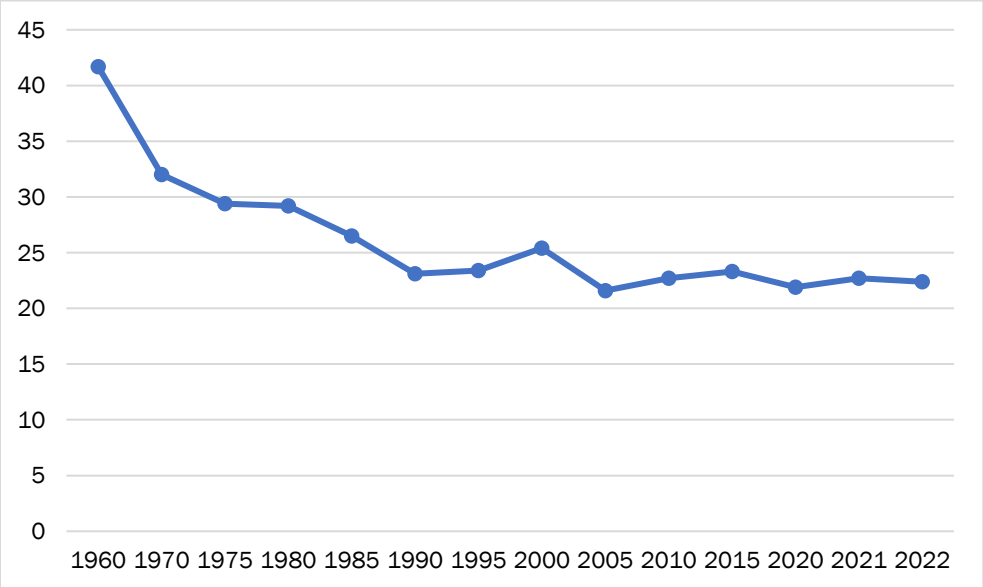
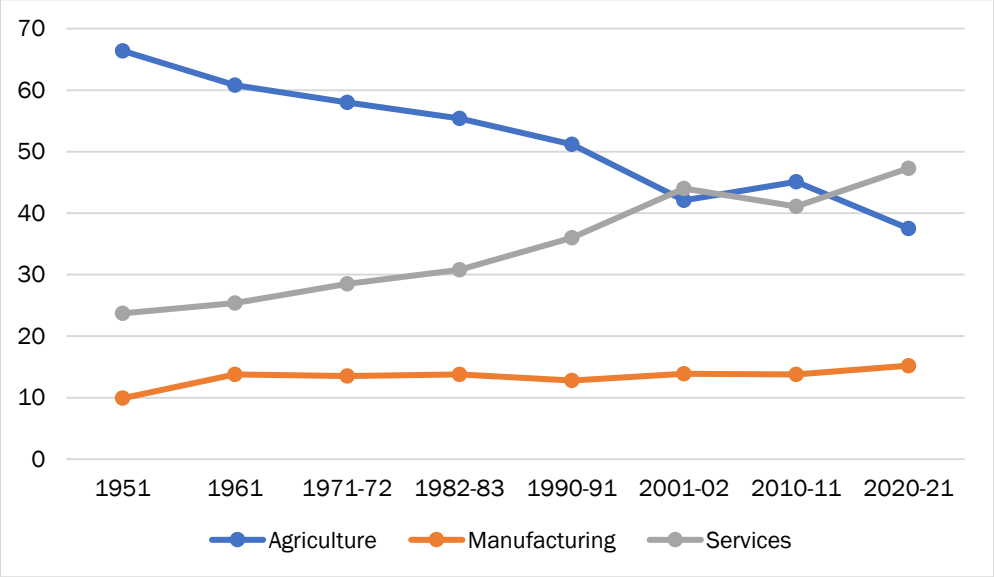


Figure 5.3 illustrates the changing sectorial distribution of the employed labor force in Pakistan. The share of employment in agriculture has significantly declined from 66.4% in 1951 to 37.5% in 2021. The services sector has overtaken agriculture as the largest employment sector since 2010–2011. A closer analysis of Figure 5.3 reveals that the most significant shift from agriculture to the services sector occurred primarily between 1951 and 1991. The manufacturing sector experienced a modest increase in its share of employment only between 1951 and 1961, with no major changes in the industrial composition over the past two decades.

Currently, the agriculture sector employs 37% of the total labor force (Figure 5.3) but contributes only 22% of the national income (Figure 5.2), indicating a significant level of disguised unemployment or underemployment in rural areas (Husain, 2023). The reallocation of labor from agriculture, which is relatively less productive, to more productive non-agricultural sectors is crucial for economic prosperity (Husain, 2023). Enhancing labor productivity through the adoption of modern technology and tools, especially by small farmers, could facilitate the reallocation of surplus labor from farming to the manufacturing and services sectors.

Figure 5.3: Trends in industrial composition of employed labor force in Pakistan, 1951–2021



Growth of the Industrial Sector

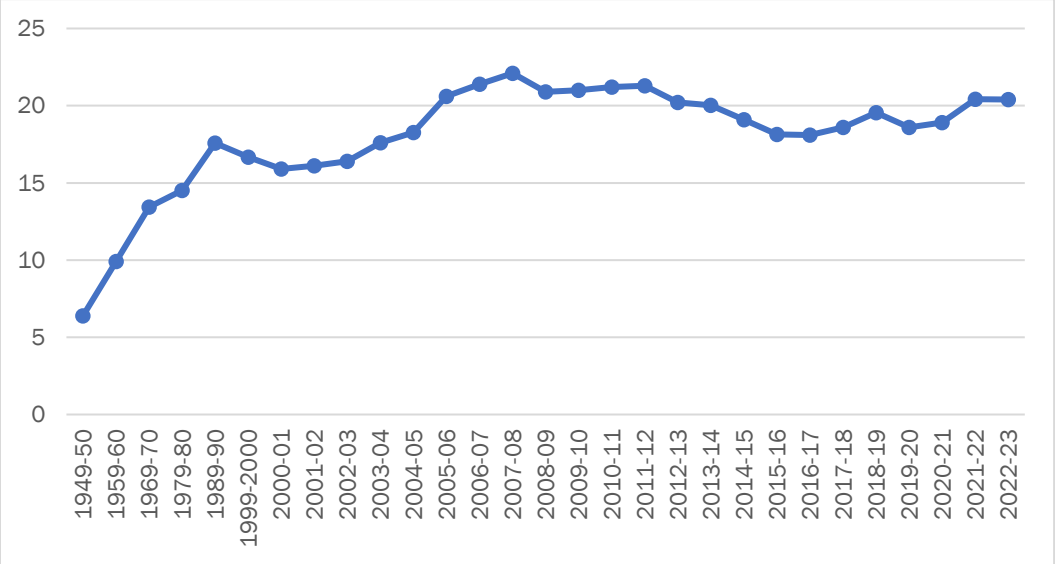
A thriving industrial sector is the driving force behind the structural transformation of a society and economy, as it fosters innovation and productivity, creates employment opportunities, and boosts global competitiveness. Countries with robust industrial sectors often experience higher, sustained economic growth and development. Pakistan's industrial sector comprises large, medium, and small-scale enterprises. This section reviews the sector's performance through two indicators: 1) its share in the GDP over the last seven decades, and 2) its share in employment.

Given its weak industrial base at the time of Independence, Pakistan has made significant progress in the manufacturing sector, increasing its share in GDP from 6.4% in 1949–1950 to 22.1% in 2007–2008, although with notable fluctuations across decades and within decades (Kemal, 2006). For example, high growth rates observed from the 1950s to the 1980s declined in the 1990s (Figure 4). A steady rise occurred from 2003–2004 to 2007–2008. Except for the most recent couple of years, Figure 5.4 shows a steady decline in the industrial sector's share of GDP. According to Pasha (2024), "the plunging of the GDP growth rate of the economy since 2017–2018 is largely attributable to the poor performance of the large-scale manufacturing sector of Pakistan." The large-scale manufacturing sector has been a key driver of economic growth in periods of rapid expansion.

Kemal (2006) identified several structural issues that have challenged the manufacturing sector from 1950 to 2005, including industrial and trade policy distortions, a narrow industrial base, low productivity levels, poor product quality, issues with public sector enterprises, high production costs, regulatory hurdles, and weak infrastructure. He noted that:

Even though total factor productivity growth rate in Pakistan has been quite high, it reflects the low efficiency levels in the base year rather than improvements in productivity resulting from technical change…The main sources of productivity growth, in particular human resource development, R&D activities, and engineering industries that provide machinery in accordance with the factor endowments of the country, have received relatively less attention in Pakistan and growth rates of productivity can be sustained provided these activities are promoted.

Figure 5.4: Percentage share of industrial sector in GDP, 1950–2023



For the period 2005–2024, the manufacturing sector's growth challenges have remain largely unchanged, with many of the same issues identified by Kemal persisting. Qadir (2023) argued that Pakistan's industrial policies have historically been reactive rather than proactive, often falling short of their goals. The lack of significant manufacturing output growth, low or negative productivity in existing industries, and a decreasing contribution of the manufacturing sector to GDP reflect these failures. Industrial policy in Pakistan has evolved from import substitution to nationalization in the 1970s, followed by privatization, and, recently, an interest in Public-Private Partnerships (PPPs). However, frequent policy changes and political instability have hindered expected outcomes (Qadir, 2023).

The share of employment in manufacturing sector increased from 10% in 1950 to 14% in 1960, but declined to 13% in 1990–1991. It has since risen steadily to 15%, as noted in the latest Labor Force Survey (LFS) 2020–2021 (Figure 5.3). Although the manufacturing sector now employs only 15% of the total labor force (Figure 5.1) and contributes 22% to the national income (Figure 5.4), it has struggled to generate sufficient jobs for the growing labor force, including rural-urban migrants.

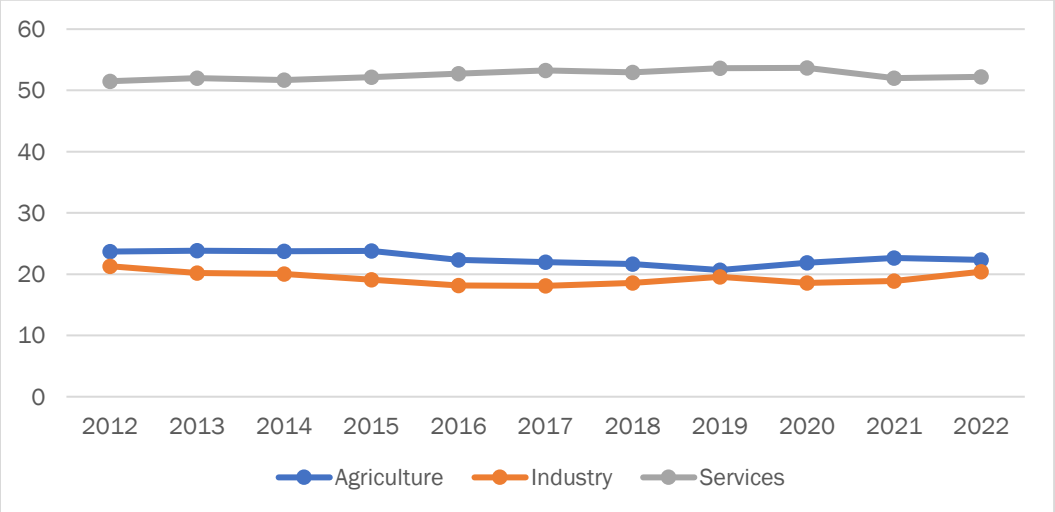
Growth of the Services Sector

The services sector, or the tertiary sector, is the third tier in the three-sector economy. It encompasses industries such as financial services, internet technology (IT), healthcare, and entertainment. Historically, manufacturing and agriculture have been viewed as the primary drivers of economic growth and development, with the expansion of the services sector seen as a consequence of this development. However, advances in technology have increasingly positioned the services sector as a key driver of growth in many developing countries, including Pakistan (Hafeez, 2022).

The evolution of Pakistan's services sector has been notable (Rathore et al., 2019). In the 1950s, economic growth was heavily reliant on agriculture, and the industrial sector was expanding rapidly, making Pakistan's growth the highest in South Asia at that time. However, this momentum declined over the years. By the 1990s, there was a significant shift in the services sector's contribution to GDP. The growth of Pakistan's IT and telecommunication sectors was spurred by privatization and the expansion of commercial banking. Economic liberalization policies enabled Pakistan's economy to integrate more effectively with global trends.

Key services industries like retail, transportation, telecommunications, banking, IT services, healthcare, and education have shown resilience and continued growth even during challenging economic periods. Today, the services sector accounts for over 50% of Pakistan's GDP (Figure 5.5) and employs around 47% of the workforce (Figure 5.3), highlighting its critical role in the country's economic development.

Figure 5.5: Distribution of GDP across economic sectors, 2012–2022



It appears from the analysis of sectoral growth that all the decline in employment in the agricultural sector in the past has been offset by growth in the services sector. The variation in jobs within the services sector is greater than in any other sector, as it encompasses unskilled workers as well as skilled and educated employees (Hafeez, 2022). This sector contributes significantly to the provision of educational and healthcare services. In addition to being labor-intensive, it is less vulnerable to external shocks and plays a crucial role in driving services exports and transitioning towards a knowledge economy.

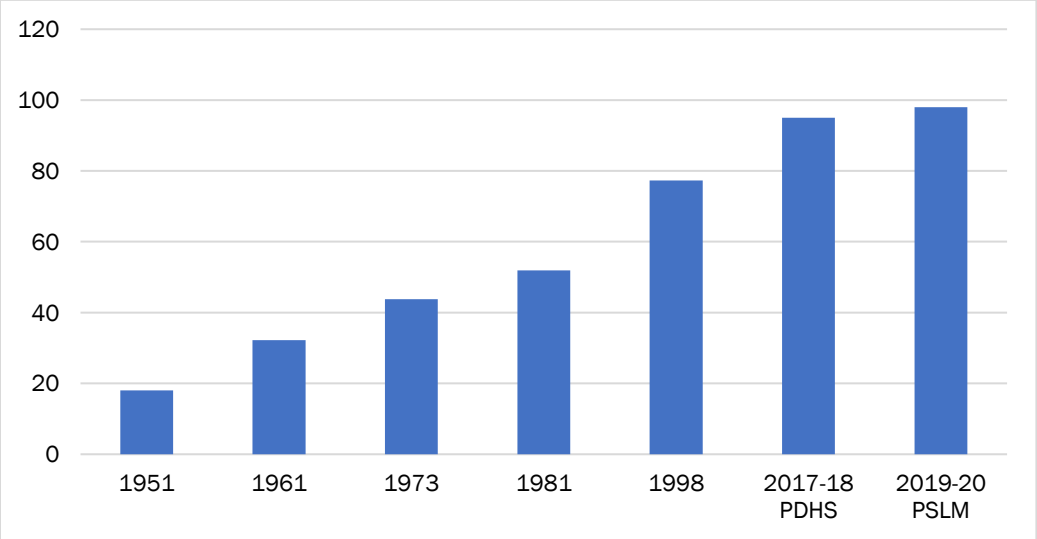
Internal Migration in Pakistan

Migration is a key driver of sectoral growth, facilitating the movement of labor from low-productivity to high-productivity sectors. The analysis of internal migration is conducted in three steps. First, the incidence of internal migration (lifetime migration) is examined using data from various sources, including population censuses (1951, 1961, 1973, 1981, 1998, and 2017), PDHS 2017–2018, and PSLM 2019–2020. Second, the magnitude and patterns of rural-urban migration are explored, primarily using the out-migration module of the 2017–2018 PDHS. Finally, the determinants of migration are assessed through a regression analysis utilizing districts-level statistics from LFS 2020–2021, PSLM 2019–2020, and the 2017 census.

Life-time Migration

Life-time migration can be better understood in an historical context. In 1951, when the first population census was carried out, the magnitude of lifetime migration was heavily influenced by Muslim immigrants from India during the time of Independence (Bashir et al., 2024). According to the 1951 census, more than one-quarter of the total population consisted of lifetime migrants, with 85% of them being immigrants, primarily from India. Currently, almost all life-time migrants relocated to their places of destinations within the country (Figure 5.6). The 2017–2018 PDHS indicates that the incidence of internal migration (lifetime) is 10.3%, which appears to be an exception. A closer examination of the questions used in the PDHS and PSLM reveals the difference between the two surveys regarding the incidence of internal migration. The PDHS asked, “Was (name) born in this village/city?” whereas the PSLM asked, “Were you born in this District?” This discrepancy suggests that both intra-district movements and inter-district mobility may have been reported in the 2017–2018 PDHS, while only inter-district mobility was captured in the 2019–2020 PSLM.

Figure 5.6: Percent share of internal lifetime migrants in total life-time migration



Another relevant piece of information is the timing when migrants moved to their current places of residence. According to the 2017–2018 PDHS, the majority of internal migrants (57%) relocated to their current residence more than 10 years ago, while less than a quarter were recent movers who migrated during the last five years. In Sindh, about two-thirds of internal migrants (64%) moved 10 or more years ago (NIPS, 2019). The upcoming 2023 population census, which has collected information on migration based on both lifetime and inter-district concepts, will provide more recent statistics on internal migration.

Table 5.1 presents data on the proportion of internal lifetime migrants in high-migration districts across four provinces, further classified into intra- and inter-province migrants.[19] In Punjab, there are nine high-migration districts including Lahore, Rawalpindi, Gujranwala, Sheikhupura, T.T. Singh, Faisalabad, Vehari, Sahiwal, and Sialkot, each showing considerable variations. For example, the incidence of internal migration in Lahore and Rawalpindi is 15%, followed by Gujranwala at 11%, and Sheikhupura at 10%. In the remaining districts listed in Table 5.1, it is less than 10%.

The intra- and inter-province dynamics are particularly interesting. Rawalpindi is the only district in Punjab where more than half of the internal migrants originated from other provinces, likely due to its proximity to Islamabad, the capital city, and the headquarters of the armed forces. In other high-migration districts, population mobility is predominantly intra-provincial. The industrial districts of central Punjab appear to be attractive locations for internal migrants in this province.

[19] For province-level incidence of life-time migration, see chapter 1 of this volume. Internal migration in Pakistan is largely intra-province in nature (Bashir et al., 2024).

Table 5.1: High-migration districts (lifetime) by province

Punjab	Districts	All internal life-time migrants (%)	Intra-province (%)	Inter-province (%)
		7.46	6.02	1.44
	Lahore	14.95	13.24	1.71
	Rawalpindi	15.04	7.39	7.65
	Gujranwala	10.59	9.53	1.06
	Sheikhupura	10.08	9.15	0.94
	T.T. Singh	8.61	7.52	1.1
	Faisalabad	8.19	7.19	1
	Vehari	7.68	6.85	0.83
	Sahiwal	7.31	6.92	0.39
	Sialkot	6.8	5.95	0.85
Sindh		5.65	3.3	2.35
	Karachi East	19.1	10.76	8.34
	Karachi West	11.39	2.61	8.78
	Mirpurkhas	10.98	10.51	0.47
	Karachi Central	10.27	4.52	5.74
	Karachi South	8.8	3.76	5.05
	Umer kot	6.99	6.35	0.64
	Sukkur	5.89	5.07	0.82
KP		4.35	3.91	0.44
	Peshawar	12.37	11.51	0.86
	Kohat	9.34	8.94	0.4
	Nowshehra	8.02	7.29	0.73
	Haripur	8.09	5.56	2.53
	Hangu	6.35	6.3	0.05
	Mardan	5.65	5.28	0.37
	Charsada	5.28	5	0.27
Balochistan		3.54	2.07	1.47
	Quetta	11.66	6.48	5.18
	Loralai	4.11	1.84	2.28
	Lasbela	3.71	2.06	1.65
	Nushki	3	3	0

In Sindh, the high-migration districts include four districts of Karachi: East, West, Central, and South as well as Mirpukhas, Umerkot, and Sukker. In Karachi East, 19% of the population consists of internal migrants, with proportions of 11% in Karachi West and 10% in Central. Mirpurkhas is also an attractive district for internal migrants, with the incidence at 11%. The majority of internal migrants in the four districts of Karachi (East, West, Central and South) originated from Punjab, Khyber Pakhtunkhwa (KP), and Balochistan. Intra-province movements dominate in Mirpurkhas, Umerkot, and Sukkur.

In KP, seven high-migration districts include Peshawar, Kohat, Nowshehra, Haripur, Hangu, Mardan, and Charsada. In Peshawar, the incidence of internal migration is 12%, followed by Kohat (9%), Nowshera (8%), Haripur (8%), Hangu (6%), Mardan (6%), and Charsada (5%). Intra-province movements dominate in all high-migration districts of KP, except for Haripur, which has attracted migrants from other provinces as well. The districts surrounding Peshawar are attractive locations for migrants. In Balochistan, Quetta, Loralai, Lasbela, and Nushki are the high-migration districts. In Quetta, about 12% of the population consists of internal migrants, while the incidence is 4% or less in the other three high-migration districts of Balochistan. The share of inter-province mobility is considerably higher in all these districts (Table 5.1).

From this analysis of internal migration, it appears that although only 6% of the overall population is counted as migrants (inter-district), in 10 districts of the country, this share ranges between 10 and 19 percent. These districts are provincial capitals or industrial hubs with high levels of urbanization. Inter-province migration is more common in Sindh and Balochistan than in Punjab and KP.

Rural-Urban Migration

Rural-urban migration plays a critical in societal transformation by shifting the workforce from the traditional agricultural sector to modern industrial and services sectors in cities. This section analyzes the phenomenon of rural-urban migration in Pakistan using the “out-migration” module of the 2017–2018 PDHS. This module is preferred over the in-migration module, discussed in the previous section, for three reasons.

First, the in-migration module was based on the lifetime concept, and the majority of migrants moved to their destinations a long time ago, whereas the out-migration module collected information specifically for the last 10 years. Second, the nature of the questions in the out-migration module explored the links between the migrant and their household in the place of origin, providing context to the possibility of structural transformation. Third, intra-district mobility is likely to have been captured in the PDHS.

Table 5.2 shows that 14% of total households reported at least one member migrating to another place within the country during the last 10 years, with that individual still residing there. The majority of migrants from Punjab and Sindh moved from within their provinces, whereas those KP, FATA, Balochistan, AJK, and GB primarily moved to other provinces or regions.

More than half of the total out-migrants relocated from rural to urban areas, with significant movement also occurring between rural-rural (21%) and urban-urban areas (22%). The share of rural-urban migration was notably higher from KP, FATA, and Balochistan compared to other provinces

and regions. The sex ratios (male/female) varied according to the direction of migration. Males predominately migrated in rural-urban movements, while a balanced sex ratio (105) was reported for urban-urban migrants. Interestingly, the sex ratio favored females for rural-rural (80) and urban to rural (47) movers.

Table 5.2: Direction of move by province during last 10 years

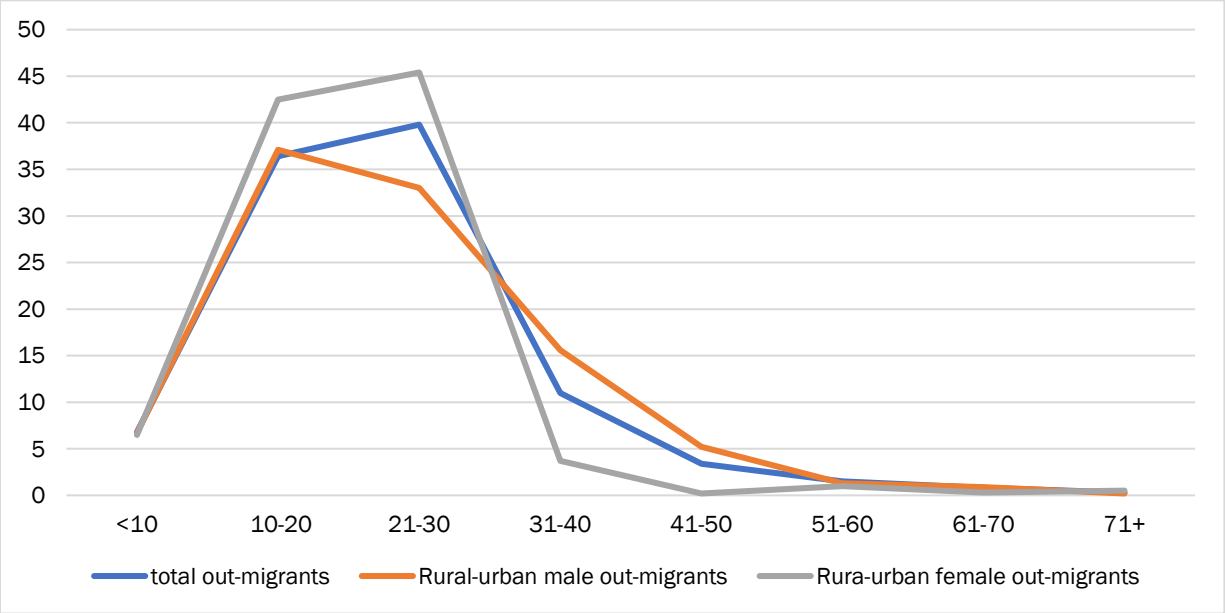
Province/ Region	% household with at least one out-migrant	% of migrants moved within the province	Direction of move				
			All out-migrants	Rural-urban	Rural-rural	Urban-urban	Urban-rural
Punjab	18.2	77.6	100	50.0	22.6	22.2	5.3
Sindh	5.7	64.7	100	40.5	7.2	40.7	11.5
KP	15.7	24.8	100	61.6	24.4	9.1	4.9
Balochistan	5.2	33.5	100	59.7	9.4	23.3	7.6
ICT Islamabad	12.2	0	100	40.8	12.8	34.9	11.6
FATA	21.2	0.4	100	75.6	18.7	2.4	3.3
Total	14.3	65.1	100	51.6	20.9	21.6	5.9
Sex ratios (male/female)			140	232	80	105	47
AJK	25.4	24.8	100	62.6	26.2	7.7	3.4
GB	28	21.7	100	71.6	16.7	10.1	1.6

Source: PDHS, 2017–18.

This sets the stage for examining the age composition of out-migrants and the reasons for migration. Figure 5.7 illustrates the age composition for three categories of out-migrants: total out-migrants (including all movement types), rural-urban male out-migrants, and rural-urban female out-migrants. In all three categories, the majority of migrants were aged 30 or younger at the time of migration. Notably, 94% of female rural-urban migrants were aged 30 years or younger when they left their place of origin, with marriage being the primary reason for their mobility.

More than three-quarters of the male rural-urban migrants were 30 years old or younger at the time of migration. Figure 5.7 shows that 16% were 31–40 years old when they migrated. This indicates that male mobility from rural to urban areas continues until the age of 40. Rural-to-urban mobility is primarily motivated by better economic opportunities, job transfers, or education (67%). However, 30% of migrants, mainly females, also moved due to marriage or to accompany their families (Appendix Table 1). These two reasons—better economic opportunities and marriage—also predominated in rural-rural and urban-urban migration patterns.

Figure 5.7: Percent distribution of total out-migrants and rural-urban out-migrants by age and gender



Determinants of Migration

As noted earlier, the 2020–2021 LFS and 2019–2020 PSLM Survey are representative at the district level. The LFS provides labor force-related statistics such as labor force participation rate, unemployment rate, employment-to-population ratio, industrial composition of employed workers (agriculture, industry, and services), and literacy rate. The PSLM survey provides data on the incidence of internal migration (inter-district) at the district level. Using these valuable statistics from the LFS and PSLM, a multivariate analysis was carried out, where a district as the unit of analysis.

The dependent variable is the "percent share of internal migrants in the district population." Four independent variables were included in the model: employment-to-population ratio, percent employed in industry, percent employed in the services sector, and literacy rate. The results of the analysis are presented in Table 5.3.

The model, based on the F-statistics, is highly significant with a reasonably high adjusted R^2 of 0.37. While percent employed in industry was found to be insignificant, three other variables—employment-to-population ratio, percent employed in services sector, and literacy rate—had a significant relationship with the internal population mobility. These findings support the discussion in the previous section, indicating that the urban manufacturing sector offers very limited opportunities for migrants, who are instead absorbed by the services sector. Internal mobility appears to be linked more to demographic pressure and limited job opportunities in rural areas rather than improvement in productivity. Climate change has also a positive association with out-migration (within country), as discussed in Chapter 7 of this volume by Lohano (2024).

Table 5.3: Determinants of migration

	Coefficients	Standard Error	t Stat
Intercept	–17.97407564	3.451128957	–5.208172706
Employment to Population Ratio	0.189926459	0.054001012	3.517090706
% employed industry	0.069134991	0.053186799	1.299852463
% employed services	0.150984584	0.039182115	3.85340564
Literacy rate	0.122664199	0.028493504	4.304988269
Adjusted R^2	0.37		
F-statistics	19.39		
N	129		

Overseas Migration

Globally, people emigrate for a wide range of reasons, and many of these factors have also driven Pakistanis to work, settle, or study in different parts of the world. Currently, the stock of overseas Pakistanis, or the Pakistani diaspora, is estimated to be around 9 million, with more than half residing in the Middle East, over a quarter (2.4 million) in Europe, and 12% (1 million) in North America (Figure 5.8). Other regions where Pakistanis have settled permanently or are living on temporary visas/permits include Africa, Australia, and New Zealand. The PDHS 2017–2018 largely confirms these stock statistics as reported by foreign missions.

Figure 5.9 shows that 7% of households reported at least one member emigrating during the last 10 years, with a relatively higher percentage of emigrants (7.6%) from rural areas compared to urban centers (6.1%). Eighty-one percent of emigrants moved to the Middle East primarily for temporary employment, 14% to Europe, and 3% to North America. The percentage of households reporting emigration of a member was much higher from AJK and KP than from other regions and provinces of the country, while it was very low from Sindh and Balochistan. High costs of migration, inadequate infrastructure, and cultural barriers are likely the main factors behind the low participation in overseas migration from these provinces.

Figure 5.8: Stock of overseas Pakistanis

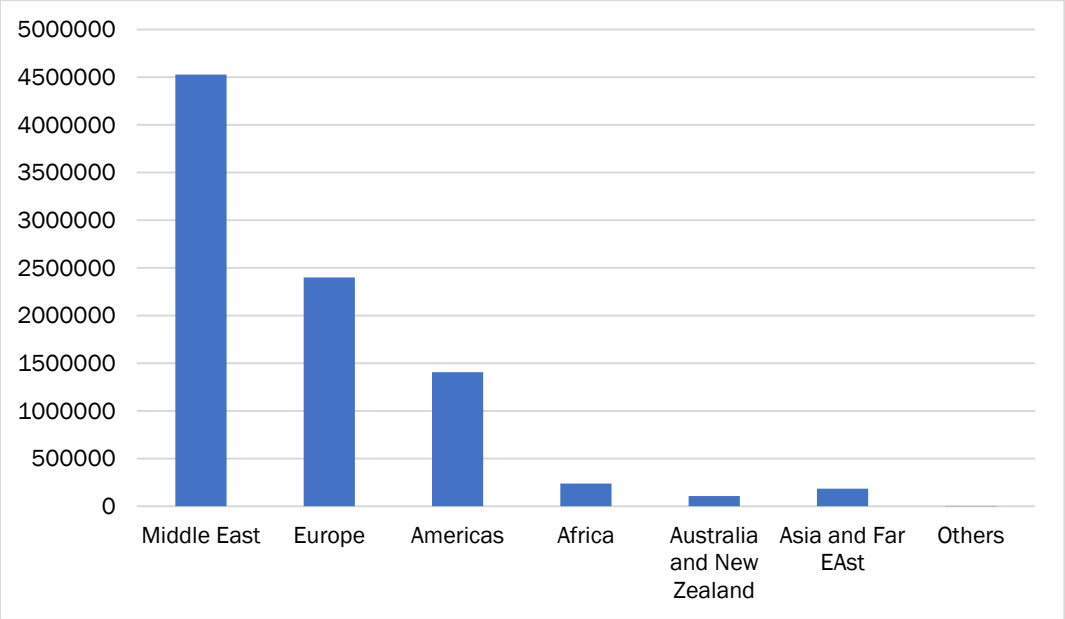
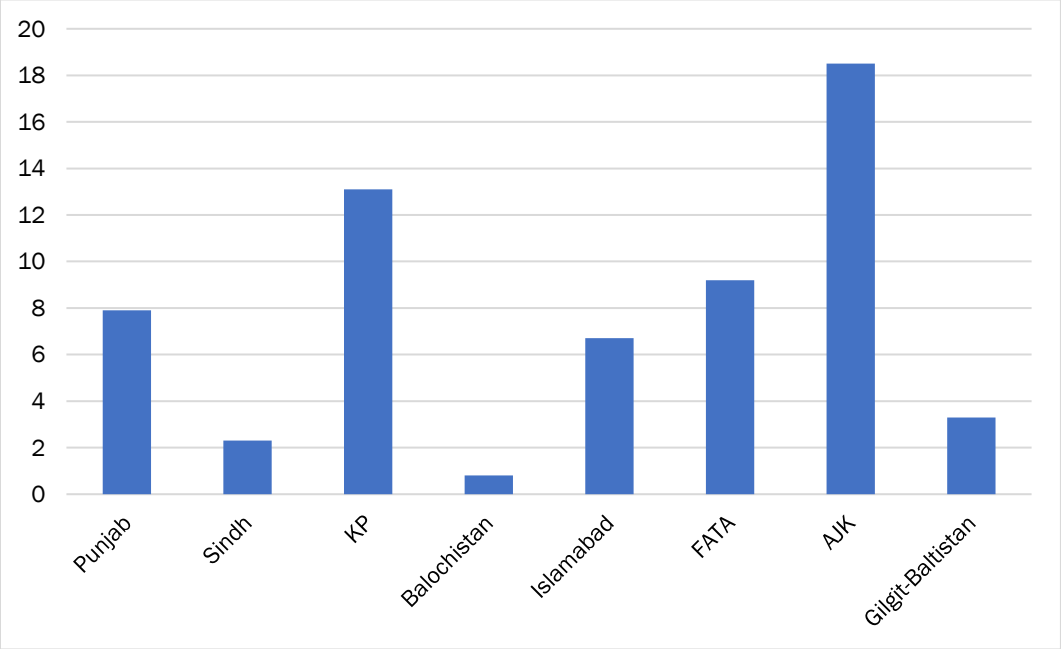


Figure 5.9: Percentage of household reporting that a household member had emigrated in the last 10 years by province and region



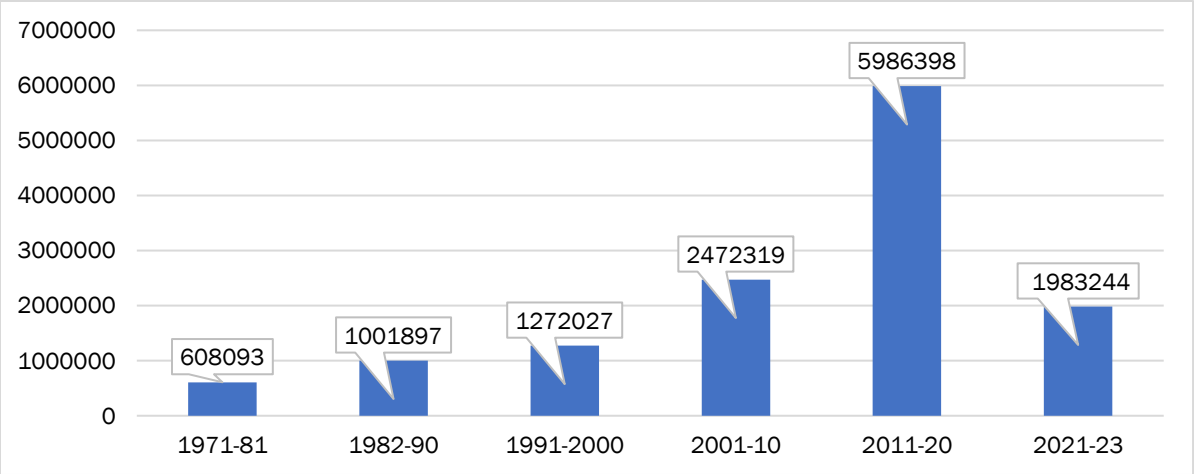
The stock data indicate the concentration of Pakistani migrant workers in the Middle East region, primarily for temporary employment. The BEOE placed approximately 13 million Pakistani workers abroad between 1971 and 2023, with the majority in the Middle East (96%). A significant increase in overseas placements occurred during the 2011–2020 period when about 6 million Pakistanis found

employment through the BEOE. More recent data from 2021–2023 also show a continuity in the placement of workers abroad (Figure 5.10).

Emigration of Pakistani workers plays a crucial role in absorbing the country's growing labor force. With a labor force of over 70 million, Pakistan ranks among the top 10 largest labor forces in the world. According to labor force surveys, about 1.5 million people are added annually on average to the labor force.[20] Recent placements of Pakistani workers abroad for employment—0.83 million in 2022 and 0.86 million in 2023—constitute more than half of the annual addition to the domestic labor force. The total placement of workers abroad during the 2006–2021 period equaled more than one-third of the new entrants to the domestic labor force. The overseas placement of workers from Khyber Pakhtunkhwa (KP) was equal to 52% of the new entrants to the provincial labor force, 37% for Punjab, and 18% for Sindh. Balochistan lagged behind in securing jobs abroad for its workers (Figure 5.11).

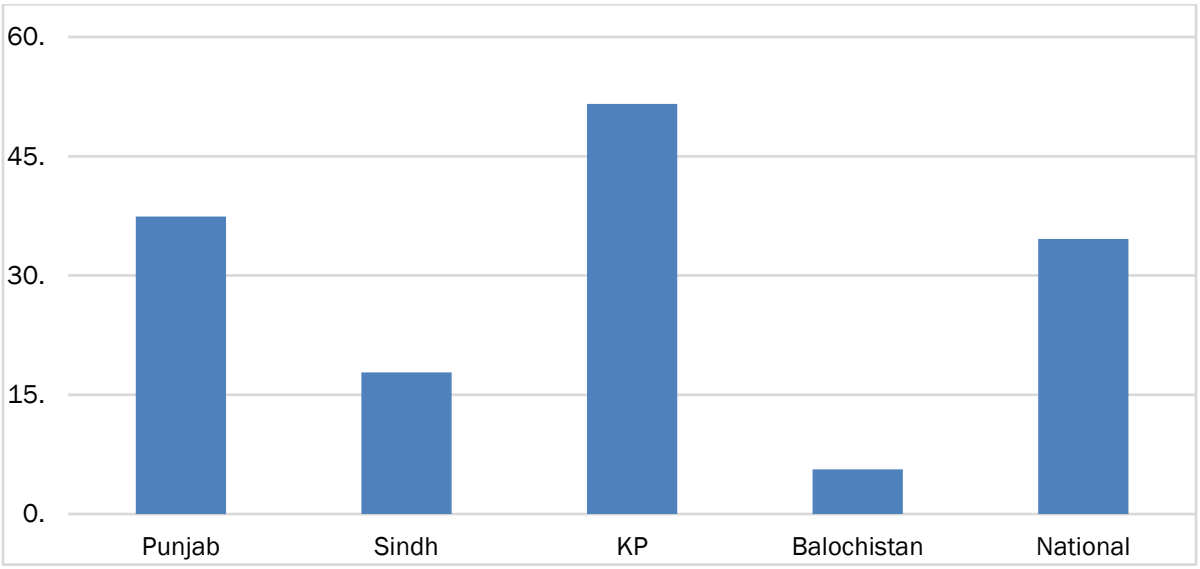
Overall, the emigration of workers has significantly reduced pressures on the domestic labor market, particularly in KP and Punjab provinces. The Government of Pakistan thus view the emigration of workers for overseas employment as an extension of its overall agenda to create decent work opportunities for all citizens.

Figure 5.10: Placement of Pakistani workers in overseas labor markets through the Bureau of Emigration and Overseas Pakistanis, 1971–2023



[20] Pakistan Labour Force Survey 2011–2012 and 2020–2021, Pakistan Bureau of Statistics, Planning and Development Division, Government of Pakistan.

Figure 5.11: Pakistani emigrant workers as a proportion of new entrants in the domestic labor force, 2006–2021



An analysis of the available data indicates that unskilled workers continue to be the dominant category among Pakistani workers placed abroad annually, followed by skilled, semi-skilled, and highly qualified workers. There has been no substantial change in the share of low-skilled or unskilled workers going to Gulf Cooperation Council (GCC) countries. This trend has significant implications for Pakistan as a labor-exporting country. As Amjad et al (2016) argue, Pakistan primarily exports low-skilled labor, which is typically low-paid and highly vulnerable to economic shocks, such as the financial crisis that began in 2007, which led to massive unemployment among low-skilled workers in destination countries. Addressing this vulnerability through skills development and training programs could raise the skill levels of most workers leaving Pakistan, better preparing them for decent jobs in destination countries.

The skill composition of Pakistani workers abroad broadly reflects the skill level of the overall labor force. Considering education as a key indicator of skill, nearly half of the labor force in Pakistan (46%) is illiterate and, among the literate portion, the majority have less than 10 years of schooling.

In recent years, Pakistan has received more remittances than earnings from the export of goods. This influx of remittances has helped mitigate the trade deficit, accumulate foreign exchange reserves, reduce the need for foreign borrowing, and support government fiscal needs (Sutradhar, 2020; Elahi and Omer, 2021). However, compared to the 27.3% increase in remittances in 2020–2022, the growth rate of remittance inflows declined to 6.2% in 2021–2022 and dropped further to -12.6% in 2022–2023. Along with Pakistan, countries like Bangladesh and Sri Lanka also experienced worsening balance-of-payment conditions, leading to currency depreciations and widening gaps between the official and market exchange rates, which negatively impacted the flows of remittances to these countries through official channels (KNOMAD, 2023).

Overseas migration has significantly improved the socio-economic status of families back home by financing education, healthcare, and entrepreneurial activities. Districts with high emigrant rates

have also benefitted from a positive spillover effect from remittances on the local economy, particularly in sectors like construction, real estate, and the rural economy (both agriculture and non-farm activities). Between 2006 and 2009, districts with higher emigration rates showed improved living standards, as evidenced by lower scores on the multidimensional poverty index (Farooq and Arif, 2023).

Irregular Migration To, and From, Pakistan[21]

The phenomenon of irregular migration has been explored in the recently published *Pakistan Migration Report 2024* by Shah et al. (2024). According to this report, irregular migration is a two-way phenomenon. Pakistan serves as a destination country for irregular migrants, mainly from Afghanistan and Bangladesh, who enter the country due to conflicts and wars in their homelands. Many of these migrants eventually become irregular residents in Pakistan, lacking any legal documents authorizing their stay.

The number of irregular Pakistanis residing in Europe has fluctuated over time, ranging from a peak of about 82,000 Pakistanis in 2015 to a low of 20,255 in 2020 during the COVID-19 pandemic. In 2022, following the pandemic, the number increased to 40,450. The distribution of irregular Pakistani migrants varies considerably across European countries. In 2022, Hungary hosted the largest number of irregular Pakistanis (7,900), followed by Austria (7,255) and Greece (6,045), while countries like Sweden, Slovakia, and Spain reported fewer than 100 irregular Pakistanis. Pakistani migrants find ways to enter Europe irregularly through both land and sea borders.

There was no consistent pattern in the routes used by irregular migrants between 2009 and 2023. In some years, land borders were the preferred method, while in others, sea borders were more commonly used. The choice of entry route likely depends on the activity levels of illegal agents and operatives who facilitate these journeys, as well as factors like the vigilance of authorities in detecting and detaining irregular migrants and the fees charged by agents for arranging entry through specific routes.

Return Migration (Overseas)

As reported earlier, more than half of the Pakistani diaspora in 2021, or 4.5 million individuals, were in the Middle East region. This figure represents less than 40% of the Pakistani emigrant workers placed abroad by the BEOE over the past five decades, indicating that more than 60% of Pakistanis who worked in the region have returned home upon completing their contracts. However, there is limited information available about their return status and reintegration into their communities of origin. It is estimated that between 1971 and 2023, more than 8 million Pakistani workers have returned from the Middle East after fulfilling their contractual obligations, a number equal to 11.6% of the domestic labor force in 2021 (Table 5.4).

Despite their potential as agents of change and development, as well as their role in fostering the growth of the middle class (Arif, 2013), Pakistani lacks a comprehensive database to register these returnees or any policy for their reintegration into local communities. Developing such a policy

[21] This section is drawn heavily from the Pakistan Migration Report 2024 (Shah et al., 2024).

framework would be a crucial step in utilizing the skills and experiences of returnees for the country's socio-economic development.

Table 5.4: Outflows and return migration

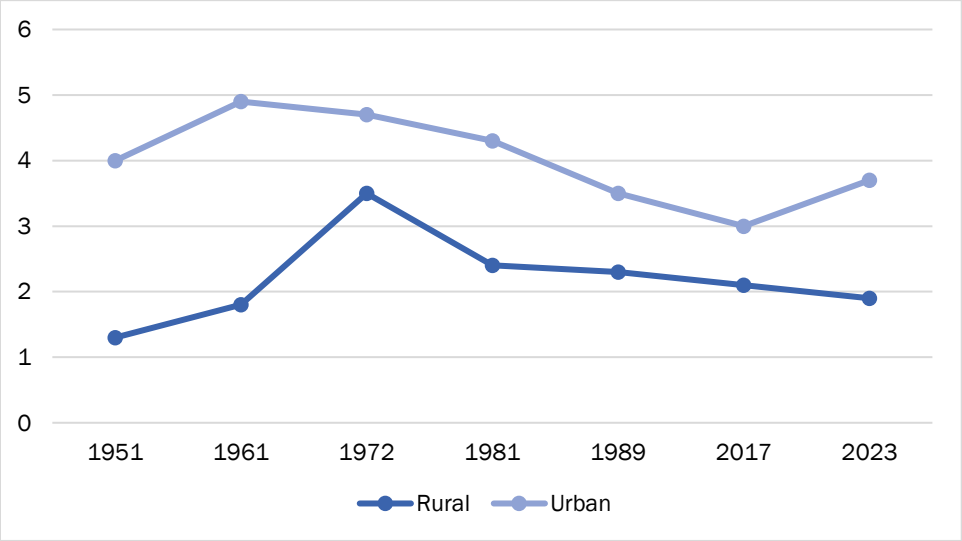
	Number and share (%)
Total outflows overseas workers 1971–2023	13.32 million
% in the Middle East	96% approx.
Total outflows to the Middle East 1971–2023	12.79 million
Total current stock in the Middle East	4.52 million
Return migration (approx.)	8.27 million
Domestic labor force 2020–2021	71 million
Return migration as % of LF	11.60%

Urbanization in Pakistan

Level of Urbanization and City System

The level of urbanization in Pakistan, based on the administrative definition used in population censuses, has increased from about 18% in 1951 to 38.8% in 2023 (Figure 5.12). The average annual population growth rate of urban areas has declined substantially from 4.9% during the 1951–1961 intercensal period to 3% for the 1998–2017 period, before increasing to 3.7% for the 2017–2023 period. The gap between urban and rural population growth rates has narrowed over time. After a shrinking gap in the urban-rural population growth rate between 1951 and 1971, the pace of urbanization increased modestly during the 1971–1981 period but declined to its lowest level for the 1998–2017 period. It rose to the level observed in 1971–1981 for the 2017–2023 period, driven by a 0.7 percentage point in annual urban growth between 2017 and 2023. This period was marked by political instability, lower GDP growth, high inflation, and reverse migration from urban to rural areas due to the COVID-19 pandemic, making the increase in urban growth difficult to explain (Bashir et al., 2024).

Figure 5.12: Average annual population growth rate (%)



The level of urbanization in KP declined by 1.5 percentage points between 2017 and 2023, while it increased in other provinces (Table 5.5). The current level of urbanization in KP, at 15%, is even lower than the level in 1981, which was 15.6%. The highest increase in urbanization level during the 2017–2023 period was observed in Punjab, where the urban population rose by 4 percentage points, with 41% of its population now living in cities and towns. An increase of 3.7 percentage points in urbanization was recorded in Balochistan, while the corresponding increase was less than 2% in Sindh, which remains the most urbanized province (54%).

Table 5.5: Percentage share of urban areas in total population by province, 1972–2023

Province/region	Urban share in population (%)				
	1972	1981	1989	2017	2023
Pakistan	25.41	28.30	32.52	36.38	38.8
Punjab	24.42	27.60	31.27	36.71	40.7
Sindh	40.45	43.32	48.75	52.02	53.7
Khyber Pakhtunkhwa	14.26	15.06	16.87	16.55	15.0
Balochistan	16.43	15.62	23.89	27.55	31.0
FATA	0.52	—	2.69	2.84	—
Islamabad	32.35	60.60	65.72	50.58	46.9

Source: Population censuses.

It is worth comparing these findings with those of studies that use alternative approaches to estimate urbanization levels in Pakistan. The urban-rural definition used in Pakistan's censuses measures administrative attributes rather than adequately reflecting the process of urbanization and agglomeration (Arif, 2003). According to Qadeer (2014), relying on the census definition significantly misrepresents Pakistan's urban nature. Applying the population density criteria used by UN Habitat, Pakistan's urban population is already well over 50% based on a purely spatial basis (Qadeer, 2014). He argues that it is equally important to understand Pakistan as an urbanized society, where life and economy have been transformed by urbanization.

Arif et al. (2023) show that, based on the classification of rural and urban areas proposed by the European Commission (EC) in 2020,[22] an additional 16.8 million should be counted as part of the urban population in 2017, compared to an equivalent addition of 3.7 million in 1998. These additional urban populations are mainly found in KP, Punjab, and Balochistan. The category of semi-dense urban clusters almost doubled to 46.4 million nationally in 2017. These findings suggest that a considerable large number of Pakistanis are living in semi-dense urban clusters, which are not yet classified as urbanized but likely are eligible for urban transition.

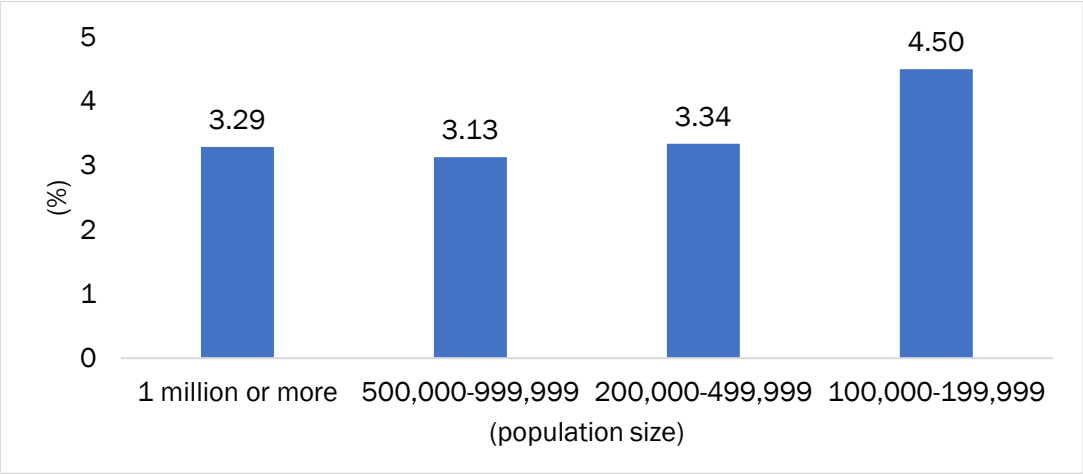
Urban population growth has also led to a significant increase in the number of urban towns and cities, rising from 388 in 1981 to 468 in 1998 (Arif and Ibrahim,1998), and further to 585 according to the 2017 census. This large increase in the number of cities and town is described as a "rural-urban transformation" by Firman (2017), based on gradual changes from rural to urban localities in Java, Indonesia.

During the 1998–2017 intercensal period, three Pakistani cities—Peshawar, Islamabad, and Quetta—joined Karachi, Lahore, Faisalabad, Rawalpindi, Gujranwala, Multan, and Hyderabad in becoming large cities with populations of one million or more. As a result, the number of large cities increased from seven to ten. These ten largest cities account for about half of the total national urban population in both 1998 and 2017, suggesting no significant change in population concentration within major cities.

Another way of assessing changes in the urban system is to look at the relative growth rates of cities at different scales. Figure 5.13 shows that the average annual population growth rate of the ten largest cities (3.29%) during the 1998–2017 intercensal period was lower than the growth rates of smaller cities with populations of less than half a million. The most significant urban growth was observed in the group of cities with populations between 100,000 and 199,999, which grew at 4.5% annually (Figure 5.13). This pattern reflects the expansion of small towns and cities, primarily district and tehsil headquarters, into medium-size cities. More than 200 top cities of the country comprise these headquarters.

[22] It classifies areas into seven categories, thus giving a wider spectrum of information rather than a binary rural/urban classification.

Figure 5.13: Average annual growth rate by size of urban agglomeration (1998–2017)



Source: Arif et al. (2023).

Component of Urban Growth

Contrary to the common observation that internal migration (from rural to urban areas) is the primary driver of urbanization, Menashe-Oren and Bocquier (2021) empirically demonstrate, using data from 129 low- and middle-income countries, that natural increase plays a greater role in urbanization, although there is significant variation across regions. Migration and reclassification contribute minimally to urban growth in regions like Latin America, the Caribbean, North Africa, and West Asia, but they have a substantial impact in Asia, particularly in countries like China and India. In sub-Saharan Africa, the slowdown in urbanization is mainly due to the declining impact of migration and reclassification. Historical evidence also shows that migration significantly influenced urban transitions in nineteenth-century Europe and some more recent urban transitions (Menashe-Oren and Bocquier, 2021).

In Pakistan, the role of migration and reclassification has remained relatively stagnant since the 1970s, contributing around 30% to urbanization (Arif and Ibrahim, 1998; Arif et al., 2023), while more than two-thirds (68%) of urban growth is due to natural population increase. The contribution of internal migration has also been steady at around 20% over a long period. This trend aligns with the incidence of internal migration, which has remained constant at about 6% of the population from 1951 to 2017. Although migration plays a significant role in urbanization, it is misleading to consider it the main factor driving urban growth in Pakistan.

Growth of Slums in Pakistan

In Pakistan, over 40% of urban residents live in slums (Mansoor and Irum, 2023). Slums areas face issues such as poor sanitation, low-quality drinking water, inadequate infrastructure, health problems, and lack of education. These areas are characterized by inadequate housing, a lack of essential utilities, and poor living conditions, which have persisted in the country.

Ahmed et al. (2022) analyzed 10 major cities in 2018 and 2019 based on four assessment components: 1) physical verification of slums and underserved areas, 2) evaluation of vaccination facilities and services (EPI Facility Assessment Surveys), 3) mapping of health resources in the union

councils, and 4) health resources in underserved urban territories. Their findings indicated that the slum population ranged from 6.9 million in Karachi to 273,840 in Islamabad City. The highest proportion of permanent settlers (staying more than two years) in slums was found in Gujranwala (92%) and Islamabad (90%), while the lowest was in Peshawar (75%); the remaining population are either temporarily displaced or are of other nationalities. The study confirmed that poverty and poor health in these areas result from low investment in both public health infrastructure and essential health and educational services (Ahmed et al., 2022). Another recent study found that the poverty rate in four slum areas of Islamabad was 57%, significantly higher than the national average (Mansoor and Irum, 2023).

Slums in Pakistan are often attributed to rural-to-urban migration and poverty. The lack of affordable housing forces lower-income individuals to reside in overcrowded, low-cost areas with makeshift housing. These areas, commonly known as *katchi abadi*s, often have high crime rates, pollution, and issues like alcohol and drug addiction. Recently, for the first time in Pakistan's urban areas (particularly in Karachi and other larger cities), people have been observed sleeping under bridges, at roundabouts, on pavements, and in open air "hotels."

Projection of Urbanization

The share of the urban population in Pakistan has been projected by the Government of Pakistan, independent researchers, and UN-Habitat. For example, Jan et al. (2008) projected that the urban population of Pakistan, which was 32.5% in 1998, would rise to 50% by 2030 using the Weighted-Matrix approach. The National Report of Pakistan for Habitat III (Ministry of Climate Change) projected that, if current trends of rural-to-urban migration continued, the urban population would exceed 50% in 2025 (GoP, 2015). However, these projections have proven unrealistic since the 2023 population census shows the urban share as 38.8%.

However, some recent projections indicate that Pakistan's urban share could reach 50% by 2050 (Express Tribute, 2022). The World Cities Report 2022 of UN-Habitat, titled "Envisaging the Future of Cities," projected the urban population of Pakistan for 2035 (Table 5.6). According to the report, the urban share in 2025 was 38.7%, which closely aligns with the results of the 2023 Census (38.8%). The report further projected that by 2035, 43.1% of the population would reside in cities and towns. The average annual rate of change for the next decade or so is projected at 2.48%.

There is growing consensus that half of Pakistan's population will be urbanized by 2050. It is worth noting here again that the administrative definition of "urban" may not fully capture the extent of urbanization in Pakistan, particularly in Khyber Pakhtunkhwa province. The actual level of urbanization is likely to be considerably higher than what has been reported in the 2023 census.

Table 5.6: Projection of urban population, percentage residing in urban and growth rate, 2015–2035

Indicator	2015	2020	2025	2030	2035
Urban population	68,227,000	77,438,000	87,777,000	99,360,000	112,484,000
Average annual rate of change of the urban population (%)	—	2.53	2.51	2.48	2.48
Percentage of population residing in urban areas (%)	36.0	37.2	38.7	40.7	43.1
Average annual rate of change of the percentage of urban (%)	—	0.62	0.81	0.99	1.15

Source: UN-Habitat (2022).

Quality of Urbanization: Adequacy of Urban Housing[23]

The housing situation in Pakistan can be assessed in terms of scale, demand, and cost. Hasan and Arif (2018) estimated a total housing backlog of around 605,000 units, with about 50% being urban. More recent estimates indicate a total housing deficit of 10.3 million units, with an urban share of 33%. Demand for housing is expected to increase from 1.07 million units per year in 2020 to 1.24 million housing units per year in 2025, with over 60% of this demand coming from lower-income groups. About 25% of unmet urban housing demand is met through the creation of *katchi abadis*, 60% through informal subdivisions of agricultural land (ISALs), and 15% through the densification of inner cities (Jabeen et al., cited in Hasan and Arif, 2018).

The Pakistan Institute of Development Economics (PIDE), however, disputes the notion of a housing deficit exceeding 10 million units. According to the PIDE Policy Viewpoint (2022), "there is certainly not a 'deficit of 10 million housing units' in Pakistan" (Nayab, 2022). Instead, the issue is one of "inadequate housing" rather than a housing shortage. The real deficit is in the quality of life within these houses, not in the absence of the units themselves. Given an average household size of well over six persons, this implies that nearly one-third of the population lacks adequate housing.

The Policy Viewpoint questions the existence of such a housing shortage, asking: Do we truly see such a vast number of people living on footpaths, roadsides, under bridges, or in any open areas? It also highlights that while the housing shortage is more pronounced in rural areas, most housing initiatives are concentrated in urban areas, aimed at pushing the government to protect or subsidize the construction sector. PIDE argues that any industry that receives protection or subsidies tends to remain unproductive, and the construction industry is no exception.

Migration from rural areas is cited as another reason for the increased housing demand in urban areas. "It is a movement that we at PIDE support. Instead of considering it a problem, we believe that it is through cities that growth happens" (Nayab, 2022). PIDE's thesis is that the real shortage is in

[23] Health, educational services, literacy, unemployment and demographics are the other indicators for assessing the quality of urbanization.

opportunities, not housing. The lack of opportunities and the high rates of sub-optimal employment reduce people's purchasing power, aligning closely with the views and thinking of the late Dr. Mahbub ul Haq and Prof. Amartya Sen.

Rural-Urban Fertility Differentials

As discussed in the conceptual framework, the structural transformation includes a demographic transition from high birth and death rates to low birth and death rates, which is associated with improved health standards in developed and urban areas. This section examines the rural-urban fertility differentials over a longer period from 1975 to 2020. Fertility levels and differentials have been extensively researched in Pakistan. Before the 1970s, there was little difference in fertility levels between rural and urban areas. Sathar (1979), using data from the 1975 Pakistan Fertility Survey (PFS), showed that the total marital fertility rate was slightly higher in urban areas than in rural areas (Table 5.7). The findings of Yusuf (1981), also based on the 1975 PFS, were similar. Both studies reported that urban marital fertility exceeded rural marital fertility at younger reproductive ages, primarily due to shorter durations of breast-feeding, which reduce birth intervals, but fell below it at older reproductive ages.

Table 5.7: Total fertility rate by rural-urban residence, 1975–2020

Source/survey	Total	Urban	Rural
PFS 1975	-	6.8	6.6
PDHS 1990-91	5.4	4.9	5.6
PDHS 2006-07	4.1	3.3	4.5
PDHS 2012-13	3.8	3.2	4.2
PDHS 2017-18	3.6	2.9	3.9
PSLM 2018-19	3.7	3.0	4.2
PDS 2020	3.7	3.1	4.1

Source: Sathar (1979); PDHS (1990-91, 2006-07, 2012-13, 2017-18, PSLM (2018-19), and PDS 2020.

However, demographic surveys conducted over the last four decades show consistently higher fertility levels in rural areas compared to urban areas. The difference increased from 0.7 children per woman to 1 child. According to the 2020 Pakistan Demographic Survey (PDS), the total fertility rate in rural areas in rural areas was 4.1, while in urban areas it was 3.1.

Adhilkari et al (2023) recently examined trends in education-specific fertility in rural and urban regions of 36 low- and middle-income countries using data from Demographic and Health Surveys (DHS). They concluded that both education and place of residence significantly influence fertility levels. The rural-urban fertility differentials that are evident when considering place of residence alone are partly explained by substantial education differences, as urban women tend to be better educated than rural ones. However, even after accounting for education, a strong and independent place-of-residence effect remains. The study's most important conclusion is that, in the context of projections, both education and place of-residence differentials need to be considered. Despite the correlation between more education and urbanization, it is not justified to assume that explicitly

considering rural or urban places of residence alone automatically captures the educational differences, or vice versa.

Waseem and Farah (2023) used two models, the coherent functional model and the functional time series model, to predict the total fertility rate in 2027 for urban and rural areas. The total fertility rate predicted by the coherent functional model was 1.7 for urban areas and 2.2 for rural areas. The total fertility rate predicted by the functional time series model was 2.1 in urban areas and 2.7 in rural areas in 2027. Rural-urban fertility differentials have implications for rural-to-urban migration, urbanization, and the structural transformation of society. The findings of Waseem and Farah (2023) supports the conclusion of Bongaarts and Sathar (2024) that Pakistan's fertility transition is close to stalling in mid-transition. The key causes of this stall are a high and unchanging desired family size, stalling demand for contraception, and relatively low satisfaction of this demand.

Discussion

As stated in the conceptual framework, five integrated factors contribute to the successful structural transformation of a society and economy:

1. A declining share of agriculture in GDP and employment
2. A rural-to-urban migration supported by both rural and urban development
3. The rise of a modern industrial and service economy
4. A demographic transition from high birth and death rates to low birth and death rates
5. Enhanced urban transformative capacity, defined as the collective ability of the stakeholders involved in urban development

The performance of the agriculture sector plays a key role in the structural transformation of a society and economy by providing food, surplus labor for urban-based manufacturing and service sectors, and reducing rural poverty. During this transformation, the share of agriculture in GDP and employment declines, with a corresponding increase in the manufacturing and services sectors. The analysis in this study presents a mixed story. While the share of agriculture in GDP and employment has declined over time, the inconsistent pattern of agricultural growth has intensified challenges related to food availability, inflation, poverty, and employment. Crop output has barely kept pace with local consumption needs for many years. In fact, agricultural growth has exceeded the required level of 5% in only a few years over the past seventy years. Poverty in Pakistan remains predominantly a rural phenomenon. The agriculture sector also suffers from disguised employment, suggesting that it has not been vibrant enough to transfer underemployed labor to higher-productivity sectors.

The performance of the manufacturing sector appears even weaker than that of the agriculture sector. Its share in GDP has in fact declined slightly over time. Historically, in the process of urbanization, the manufacturing sector has driven economic growth and transformation. Although the share of employment in the manufacturing sector has increased from 10% in 1950 to 15% of the total labor force in 2020–2021, this is much lower than its 22% contribution to GDP. The sector has been unable to create sufficient jobs for the growing labor force and rural-to-urban migrants. The poor performance of the manufacturing sector is likely a major obstacle to the success of the structural transformation of society and economy.

Despite its limitations, the services sector in Pakistan has several positive aspects. It has not only increased its share in GDP but has also been a major source of employment for both the growing labor force and the migrant population. This sector should be viewed as an engine of sustainable and inclusive growth, with the capacity to absorb both skilled and unskilled workers.

It is important to note that internal migration in Pakistan is moderate and has remained relatively constant over time. As shown in the district-level multivariate analysis, it is likely only the informal services sector has absorbed rural-to-urban migrants. Migration and development can be seen as two sides of the same coin: development leads to migration, and migration contributes to development. In Pakistan, migration provides human capital (young migrants) to urban-based sectors and industries, and, through domestic remittances, it also contributes in rural and agricultural development. According to the 2018–2019 Household Integrated Economic Survey, the foreign remittances accounted for about 5% of total household income, while domestic remittances accounted for 3.6%. The share of domestic remittances was higher than that of foreign remittances for the first three relatively poorer quintiles, making internal migration a crucial source of livelihood for many poor households.

Overseas migration of Pakistani workers has been a major factor in transforming society and the economy in three ways. First, it has eased pressure on the domestic labor market by providing overseas employment opportunities for young workers. Second, the significant inflows of foreign remittances benefit the economy as well as the wellbeing of remittance-receiving households and society as a whole. Third, returning emigrants bring back new skills and remittances, promoting entrepreneurship in the country. Migration sharply increases the rewards for labor among the less skilled and the returns on education for the more skilled, lifting millions of migrants and their families out of poverty.

However, concerns remain widespread that skilled migration could inflict net economic harm to Pakistan's economy, often referred to in the media as a "brain drain." Shah et al. (2024) rightly observed:

> We do not find any evidence of a massive and unprecedented outflow of professional and highly skilled workers in 2022–2023 as mentioned repeatedly in the press. The rise in the number of outgoing workers following the pandemic is essentially an outcome of the return to normalcy following the COVID-19 pandemic. An analysis of trends in emigration of highly qualified and skilled persons does not show any alarming rise during the last decade. The hype relating to the excessive brain drain that may spell disaster for the economy is generally based on rhetoric and not a scientific analysis of the patterns of migration from Pakistan. Furthermore, Pakistan is not exceptional in terms of people's wish to move to another country.

Is Pakistan over-urbanized or simply experiencing unplanned urbanization? It is argued that given the growth of the "urban services sector," the current level of urbanization is neither unplanned nor indicative of over-urbanization. By broadening the development perspective beyond mere economic growth to include technological sophistication, educational achievements, health, and general standards of living—as observed by Menashe-Oren and Bocquier (2021) for sub-Saharan Africa—

urbanization in Pakistan can be seen as related to development and not dissimilar to global or historical trends. Development may progress more slowly where migration plays a minor role in urbanization since the transfer of labor from low- to high-productivity activities remains limited. The role of internal migration in urbanization has been slower and remained moderate or even minor. Urbanization is primarily driven by natural increase. Well-managed urbanization can improve access to education, healthcare, and housing, increase productivity, and expand opportunities. There is a need for sustainable urban planning, including slum management and the provision of basic services.

The story of demographic transition is interesting. Urban fertility has declined from 6.8 children per woman in 1975 to 3.1 in 2020, while rural fertility has declined more slowly. This transition over seven decades is indeed much slower compared to other countries of the region. Fertility is projected to remain above replacement level for a decade or so. Our analysis suggests that this slow fertility transition is partly due to Pakistan's slow progress in economic growth and development. Faster and more consistent growth in the agriculture and manufacturing sectors might have accelerated the decline in fertility to replacement levels. This issue has been explored in detail in the next chapter by Said and Malik (2024).

Finally, urban transformative capacity is a new concept for urban development. A key strategy for transforming urban areas is "urban regeneration"—an area-based intervention initiated, funded, supported, or inspired by the state to produce significant sustainable improvements in the conditions of local people, communities, and places suffering from deprivation (Wolfram, 2019). It represents a high-profile field of governmental intervention, reflecting core policy priorities. While assessing transformative capacity for sustainable "urban regeneration" in three South Korean cities, Wolfram (2019) used a recognizable policy agenda for urban regeneration as a dependent variable in qualitative research. The criteria used to diversify independent variables included the local political–administrative constitution, governmental functions, and the political orientation of the local government. The findings showed that the governance of "urban regeneration" has strong parallels in the three cities, clearly framed by national regulation. Leadership plays a crucial role in each city, although mostly without being truly transformative. The mayors in these cities all provide strong political direction. However, enhancing urban transformative capacity in Pakistan requires in-depth research. Currently, urban governance in Pakistan appears to be weak due to an ineffective local government system; for example, local government elections in Islamabad, the capital city, have been postponed multiple times. Many large cities in the country are operating without a city government or mayor.

Migration, Urbanization, and Structural Transformation by 2050

What is the outlook for Pakistan by 2050 concerning migration, urbanization, and structural transformation? Predicting this is challenging. Given the current macroeconomic situation—with respect to low GDP growth, high indebtedness, inflation, and low human capital—a significant improvement in the transformation of the three sectors of the economy (agriculture, manufacturing,

and services), labor productivity, urban migration, and demographic transition is unlikely within the next decade. However, the China-Pakistan Economic Corridor (CPEC) initiative offers hope for this transformation, as its projects include sectors like energy, transport infrastructure, Gwader projects, industrial cooperation/special economic zones, and social sector development. CPEC also encompasses several agriculture-related projects and is seen as a potential game changer. Furthermore, steps like the "education emergency" to enroll out-of-school children will help enhance the skill level and productivity of future workers. The achievement of CCI demographic targets, as discussed in Chapters 3&4 of this volume, is also likely to contribute in sustained high economic growth through changes in age structure, increased savings and investment (KC et al., 2024; Mukhtar, 2024).

It is expected that between 2030 and 2050, Pakistan will see gradual yet significant sustainable improvements in economic and social transformation, including the rise of a modern industrial and service economy, modernization of agriculture, rural-to-urban migration underpinned by rural and urban development, and a demographic transition from high to low birth and death rates. Urban governance is also expected to improve with a strengthened local government system, thereby enhancing urban transformative capacity. Political stability will be essential for achieving these goals. With a relatively high level of urbanization (≥ 50%), improved human capital, industrial growth, demographic transition, and better urban governance, Pakistan could be well-positioned for a more prosperous future by 2050.

Conclusions and Policy Implications

The nexus between migration, urbanization, and structural transformation partially holds true in Pakistan—highlighting key areas where demographic shifts, sectoral changes, and economic opportunities intersect to shape the country's development trajectory:

1. **Agriculture and manufacturing.** While the agriculture and manufacturing sectors contributed little to labor mobility from the traditional low-productivity agriculture sector to manufacturing, the urban services sector absorbed the growing labor force, including rural-to-urban migrants. Disguised unemployment in the agriculture sector remained high; despite its 20% share in GDP, it provides employment to around 40% of the labor force.
2. **Rural-to-urban migration.** Rural-to-urban migration is not supported by rural development but is instead driven by demographic pressures and poverty, generating migratory flows.
3. **Overseas migration.** Temporary overseas migration offers opportunities for the growing labor force, with returning emigrant workers bringing skills and remittances, contributing to a "brain gain" for the country.
4. **Urbanization and the services sector.** Despite challenges such as slum growth and low-quality housing, urbanization contributed to GDP growth through the expansion of the services sector, providing employment opportunities and a better quality of life in cities and towns.

5. **Fertility transition.** Fertility transition in Pakistan has been slow and delayed, but projections suggest that the desired replacement fertility level may soon be achieved in urban areas.
6. **Long-term outlook.** While significant improvements in structural transformation are unlikely in the short term (in the next decade), long-term outlook for 2050 appears more promising.

Policy implications focus on strategies to strengthen Pakistan's structural transformation by enhancing sectoral development, improving urban governance, promoting sustainable urbanization, accelerating demographic transition, and effectively utilizing the skills and remittances of returning overseas workers:

1. **Agriculture and manufacturing.** Pakistan's economy has three critical sectors—agriculture, manufacturing, and services—all of which are vital for sustained development and structural transformation of the society and economy. Public policies should address all three sectors to ensure food security, reduce rural and urban poverty, and improve the quality of life.
2. **Urban transformative capacity.** Empowering city governments to involve all stakeholders is essential for enhancing urban transformative capacity, which will help to achieve the SDG targets to make cities and human settlements inclusive, safe, resilient, and sustainable.
3. **Quality of urbanization.** Focusing on improving the quality of urbanization by addressing issues like housing, education, health, transport, and environment will make cities inclusive, resilient, and sustainable.
4. **Rural-urban linkages.** Infrastructure development is needed to strengthen the connections between rural and urban areas.
5. **Demographic transition.** Accelerating demographic transition or the achievement of CCI targets should be a major goal of both the state and society, with an emphasis on creating opportunities for youth in the domestic labor market.
6. **Utilizing overseas skills.** A comprehensive strategy should be developed to effectively utilize the skills and remittances of returning overseas workers for national development.

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CHAPTER 6

Rethinking the Role of Structural Change in Fertility Transition

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Introduction

Pakistan is currently facing the unique challenge of a stalled fertility transition amidst decreasing mortality rates, increasing life expectancy, and rapid population growth (UNDP, 2023). Unlike its regional counterparts, such as Bangladesh, Sri Lanka, and India, Pakistan's fertility rate has stagnated, with recent analyses indicating that the country is approaching a standstill in its mid-transition phase (Bongaarts and Sathar, 2024). This contrasts sharply with the rapid fertility declines seen in much of South Asia and highlights the broader complexities of fertility transitions in the developing world, particularly in Pakistan.

Fertility stalls are not uncommon in developing countries. A wealth of demographic literature documents that sub-Saharan Africa has experienced similar challenges, with many nations showing slower fertility declines since the early 2000s (Schoumaker, 2019; Bongaarts, 2008; Shapiro and Hinde, 2017). In over half of these transitioning countries, fertility rates plateaued during their mid-transition phase, mirroring Pakistan's current experience. Studies on Kenya and Ghana, for example, have highlighted how fertility stalls can coincide with economic growth, yet show stagnation in female education rates and reductions in child mortality (Bongaarts, 2006; Shapiro and Gebreselassi, 2008). These regional dynamics underscore the diversity of fertility transitions across the world and the factors influencing them.

One line of research links fertility declines to economic growth. Lessons from low- and middle-income countries suggest that fertility rates may temporarily rise during economic downturns but gradually decline following sustained periods of growth (Chatterjee and Vogl, 2018). However, the connection between socioeconomic changes and fertility stalls is not straightforward. While regions such as East and Southeast Asia and Latin America experienced simultaneous declines in fertility and significant economic expansion (Jones and Tertilt, 2006), similar patterns are not as evident in sub-Saharan Africa despite its robust economic growth (Büttner et al., 2023; Rodrik, 2018).[24]

[24] On average, GDP per capita in Sub-Saharan Africa has seen an annual increase of approximately 3% since the early 2000s (Rodrik, 2018). Some countries, such as Côte d'Ivoire, Ethiopia, and Tanzania, have even witnessed per capita growth exceeding % annually in recent years. Additionally, the poverty headcount index has declined from 59.4% in 1999 to around 40.2% in 2018 (Bank, 2020).

Empirical studies suggest that structural transformation—the migration of labor from agriculture to industry—is crucial in explaining fertility declines (McMillan and Harttgen, 2014b; Diao et al., 2017). Economic modernization disrupts traditional family structures, reducing reliance on child labor and increasing the returns to investing in human capital (Coale and Hoover, 1958; Becker, 1981). However, when economic growth relies on the expansion of agriculture and the informal sector, as seen in sub-Saharan Africa, fertility may remain high (de Vries et al., 2015). In countries like Kenya, economic stagnation coincided with fertility stalls, while in other contexts like Ghana, rising incomes accompanied continued high fertility, suggesting that economic trends alone do not fully explain the dynamics of fertility transitions (Shapiro and Gebreselassi, 2008; Bongaarts, 2006).

Recent literature highlights the role of female education in mediating fertility transitions. In sub-Saharan Africa, disruptions to female education have been linked to fertility stalls (Kebede et al., 2019; Büttner et al., 2023). In regions with high levels of stunting, low female education, and limited economic opportunities for women, returns to child labor remain relatively high, making large families more economically viable (Bank, 2020; Sathar et al., 2013). This contrasts with Bangladesh, where government-backed education programs and family planning initiatives contributed to rapid fertility decline, despite different levels of economic growth and urbanization compared to other countries (de Silva and Tenreyro, 2017). While contraceptive use has also played a significant role in fertility transitions, especially in countries like Bangladesh (Westoff and Cross, 2006; Ezeh et al., 2009), this chapter focuses on broader socioeconomic drivers, particularly education and structural change.

This chapter aims to shed light on the role that traditional explanations—sectoral transformation, female education, and economic participation, and the motivations behind investment in children—play in the Pakistan's stalled fertility. We present four key insights:

1. Structural changes, while important elsewhere, show a weak association with fertility decline in Pakistan. Despite declining agricultural employment, the link between sectoral shifts and fertility rates remains statistically insignificant.
2. Female education emerges as a critical driver of fertility transitions. Using Demographic and Health Surveys (DHS) data, we find that each additional year of schooling delays marriage by 0.2 years, contributing to lower fertility.
3. Female labor force participation in Pakistan has stagnated, potentially contributing to high and stagnant fertility rates. Entrenched gender norms and limited economic opportunities for women continue to act as barriers.
4. Economic models suggest that wealthier families tend to opt for smaller family sizes and invest more in their children's education and health, while lower-income families favor larger families as a form of security. Programs like cash transfers and pensions show promise in breaking this cycle by reducing the economic necessity for large families.

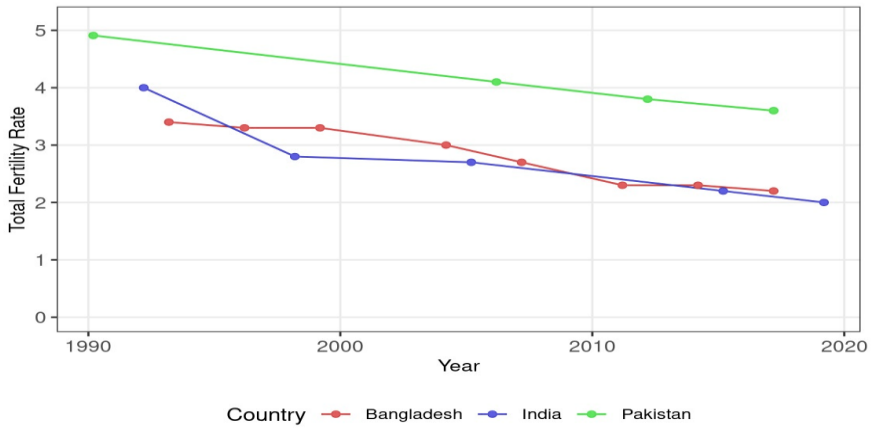
The rest of the chapter is organized as follows: Section 2 describes the trends observed in sectoral change, urbanization, educational attainment, and fertility transition in Pakistan in comparison to India and Bangladesh. Section 3 lays out the conceptual frameworks and provides a summary of the data used in this chapter. Section 4 discusses the possible relationship between structural change and

fertility in Pakistan. Section 5 explores the role of women's economic participation and reproductive choices within households. Finally, Section 6 consolidates the discussion and concludes the chapter.

Structural Change and Fertility Transition: A Situation Analysis of Bangladesh, India, and Pakistan

We plot the total fertility rate (TFR), defined as the average number of births a woman would have during her reproductive age (15 to 49 years) if she were to give birth in alignment with the age-specific fertility rates observed in that country during a specific year. For this analysis, we compare Pakistan with India and Bangladesh—countries that provide close comparisons due to regional proximity, shared history, and culture. We use data from Demographic and Health Surveys (DHS) in Bangladesh, India, and Pakistan between 1990 and 2021 to calculate the TFR.[25]

Figure 6.1: Total fertility Rate (TFR) over time in Bangladesh, India, and Pakistan



Note: Author's calculation. This graph plots the TFR for Bangladesh, India and Pakistan with years displayed on the x-axis. Data for the graph is from DHS collected in Bangladesh in the 1993–1994, 1996–1997, 1999–2000, 2004, 2007, 2011, 2014 and 2017-18 rounds; for India in the 1992–1993, 1998–1999, 2005–2006, 2015–2016 and 2019–2021 rounds; and for Pakistan in the 1990–1991, 2006–2007, 2012–2013 and 2017–2018 rounds.

Figure 6.1 plots the TFR for each country using DHS data. Pakistan is a clear outlier, with a significantly higher TFR compared to its regional counterparts. In addition, fertility in Bangladesh has almost halved, decreasing from 4 to 2, and has decreased by more than a third for India, from 3.4 to 2.2. By contrast, Pakistan's TFR is consistently higher and has decreased by 28%, from a high of 5 in 1990 to 3.6 in 2018. The difference in TFR is striking: Pakistan's current TFR is close to the TFR Bangladesh had three decades ago.

The persistence of high and slowly declining fertility in Pakistan raises questions. Several factors known to drive fertility transitions in other countries—urbanization, female education, child mortality rates, and the proportion of the labor force in agriculture—are explored in this context in Figure 6.2.[26]

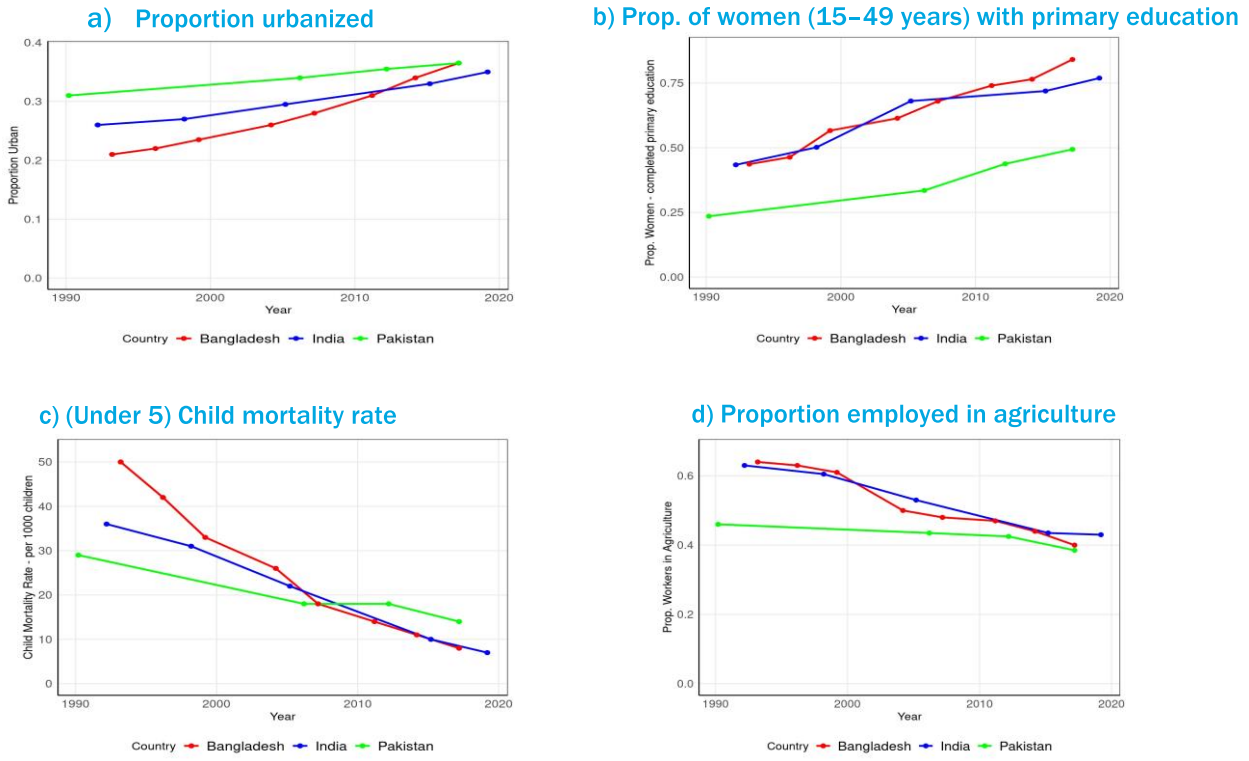
[25] All available standard DHS datasets for the three countries have been utilized in the analysis which includes four surveys for Pakistan, eight surveys for Bangladesh, and five surveys for India.

[26] We do not have data on wealth index for all countries and years plotted in DHS. We control for national wealth distribution using a different dataset in the analysis shown in Table 1 later.

There are some similarities in how these measures trend for the three countries: urbanization and female educational attainment have increased, while under-5 child morality and the proportion of working population engaged in agriculture have decreased over the last three decades (Figure 6.2c).

However, three key exceptions emerge for Pakistan compared to Bangladesh and India. First, although the current state of urbanization is not different, the pace of urbanization in Bangladesh has been much faster than in Pakistan. Second, while trends in female education have appeared similar, a much lower proportion of Pakistan's female population aged 15–49 years has received primary education (Figure 6.2b): 49% in Pakistan compared to 84% and 77% for Bangladesh and India, respectively, per the most recent DHS round in each country. The trends in female education between Bangladesh and India have been remarkably similar, both in level and direction over time. Third, while Bangladesh and India continued to transition out of agriculture into industry, white collar, and high-skilled work, the proportion of the workforce that is employed in agriculture in Pakistan has remained relatively constant. For more discussion on changes in Pakistan's agriculture sector overtime, see Chapter 5 by Arif (2024).

Figure 6.2: Urbanization, education, child mortality and employment in agriculture over time



Note: Author's calculation. Each panel plots average value of the specified outcome with years displayed on the x-axis, for Bangladesh, India and Pakistan. Data for panels 2b and 2c is from DHS. Data for panels 2a is from the UN Population Division reported by the World Bank (available here: https://data.worldbank.org/). Data for panel 2d is from ILO (available here: https://ilostat.ilo.org/).

Conceptual Framework and Methodology

Conceptual Framework

The conceptual framework of this chapter draws on several key ideas from demographic and economic theory to explain the factors driving fertility transitions, particularly in the context of Pakistan. Becker et al.'s (1990) theory of fertility serves as a foundation, suggesting that families in low-income settings weigh the costs and benefits of having children, with smaller families allowing for greater investment in each child's education and health. In this framework, economic growth and sectoral transformation—specifically the shift from agriculture to industry—are expected to decrease the economic utility of large families, leading to a fertility decline (Becker, 1981).

As discussed earlier, historical patterns of economic growth in regions like East Asia, and Latin America have been accompanied by falling fertility rates (Jones and Tertilt, 2006; Bloom and Williamson, 1998).[27] The transition away from agriculture has reduced the reliance on child labor, expanded education, and created more employment opportunities for women, all of which contribute to lower fertility rates (Büttner et al., 2023). Several studies hypothesize that the lack of structural change in Africa is a key factor behind stalled fertility transitions in that region (McMillan and Harttgen, 2014a; de Vries et al., 2015; Diao et al., 2017; Rodrik, 2018). Although extensive theoretical literature exists on this topic, empirical evidence supporting a causal relationship is limited due to complex identification challenges arising from potential reverse causality and omitted variable bias (Cheung, 2023). Consequently, while unified growth theory posits that structural transformation contributed to the initiation of the fertility decline (e.g., Franck and Galor, 2015), empirical confirmation of this link remains elusive. Further, a nuanced empirical examination of structural transformation in the United States suggests that the reduced fertility in the early 1900s, typically attributed solely to the shift from agriculture to manufacturing, was in fact driven by human capital formation resulting from structural changes (Ager et al., 2020).

In the case of Pakistan, fertility has remained high even during periods of economic growth. The correlation between sectoral shifts and fertility remains weak, in contrast to other regions where structural change played a significant role in fertility transitions. Education, particularly for women, may be a critical factor in this process. Numerous studies have demonstrated that higher levels of education for women lead to delayed marriage, increased reproductive autonomy, and lower fertility rates (Rosenzweig and Wolpin, 2000; Kebede et al., 2019). Educated women are more likely to invest in their children's health and education, contributing to smaller family sizes. The relationship between female education and fertility is well-documented across various contexts, where each additional year of schooling is associated with a delay in marriage and a reduction in fertility.[28]

Another important factor is female labor force participation. Global trends suggest a negative relationship between women's economic participation and fertility, as women's participation often leads to delayed childbirth and smaller family sizes due to the higher opportunity costs associated

[27] For more discussion on economic growth and demographic transition, see Chapter 4 of this volume by Mukhtar (2024).
[28] Chapters 2&3 of this volume have examined the relationship between female education and fertility in detail (Bashir et al., 2024; KC et al., 2024).

with having children (Angrist and Evans, 1998; Rosenzweig and Wolpin, 2000). Evidence from other developing countries demonstrates the potential of employment prospects to influence fertility decisions. For instance, research in India found that young women who gained access to stable factory jobs delayed marriage and reduced their desired family size (Sivasankaran, 2014). Similar findings from other parts of South Asia and Senegal underscore the importance of decent work in empowering women to make choices that reduce fertility (Jensen, 2012; Van den Broeck and Maertens, 2015).

Finally, economic models suggest that household wealth plays a significant role in fertility decisions. Wealthier families are more likely to have fewer children and invest in their education and health, while poorer families may view children as a source of labor or security, especially in contexts with limited access to social safety nets (Becker, 1981; Becker et al., 1990; Ray, 2000). In such settings, larger families are seen as a way to diversify income streams or provide support in old age. High levels of child mortality can incentivize parents to have more children as a form of insurance against potential losses (Pörtner, 2001). This aligns with the broader literature on fertility transitions, which suggests that higher returns to education and skilled labor can shift preferences toward smaller families and greater human capital investment (Becker, 1981). Urbanization, on the other hand, tends to decrease the demand for children due to higher living costs in cities.

Recent research has underscored the multifaceted nature of fertility decline, with factors such as child mortality, urbanization, household wealth, and female education playing significant roles (Bongaarts and Casterline, 2013). Recognizing the importance of these factors, our analysis incorporates them to better understand the dynamics driving fertility rates in Pakistan and the relative importance of sectoral transformation.

Methodology and Data

This chapter draws insights from existing literature on fertility transitions and uses a descriptive approach to explore fertility patterns in Pakistan, comparing these trends with those observed in South Asian countries such as India and Bangladesh, as well as other low- and middle-income countries. Our analysis integrates findings from demographic and economic studies with data from multiple sources that capture fertility, socioeconomic factors, and demographic indicators. These include nationally representative surveys, international databases, and country-level datasets.

Specifically, we use the following datasets:

1. **Demographic and Health Surveys (DHS)** data is used in the analysis discussed above on 'Structural change and fertility transition: a situation analysis of Bangladesh, India and Pakistan'. The DHS program provides reliable cross-country data on fertility, maternal and child health, family planning, and key socioeconomic variables. We use DHS data for Bangladesh, India, and Pakistan from 1990 to 2021, which includes information on Total Fertility Rates (TFR), educational attainment, urbanization, and child mortality. The TFR is calculated using the number of live births reported in the surveys and the number of years of exposure.[29]

[29] As per definition provided by OECD (https://data.oecd.org/pop/fertility-rates.htm). We use the 'TFR2' command in stata to compute the TFR for each country and year. The TFR2 command allows calculating TFR from micro data, such

2. The **Jobs of the World Dataset (JWD)** covers labor market outcomes and sectoral composition across 63 low- and middle-income countries across five regions, including but not limited to Pakistan and Bangladesh. The dataset was funded by the IZA under the G2LM|LIC Jobs of the World initiative to explore labor market outcomes across the developing world.[30] A list of countries and years for which data is available can be found in Appendix Table A1. It provides comprehensive data on urbanization, female labor force participation, sectoral shifts, and employment in agriculture. This dataset allows us to analyze the socioeconomic factors affecting fertility patterns in Pakistan and place them in a global context.
3. **International Labour Organization**, **World Bank**, and **United Nations** databases provide insights into labor force participation (particularly female labor force participation), urbanization, child mortality, and education trends. This data informs our analysis of the relationship between socioeconomic conditions and fertility rates, allowing for cross-country comparisons of key factors such as education and employment.
4. Finally, for complementary analysis, we use the **Punjab Multiple Indicator Cluster Surveys (MICS)** for years 2003–2018 to explore the impact of the Female Secondary Stipend Programme (FSSP) in Punjab on family size.

We use this rich compilation of datasets to explore a range of potential correlates of fertility. In doing so, we aim to provide a comprehensive view of the factors influencing fertility transitions in Pakistan, particularly in comparison to its regional counterparts.

Structural Forces and Fertility (Age at Marriage)

Though the patterns discussed earlier suggest that urbanization, education, and sectoral changes could play a role in influencing fertility rates, establishing a direct causal relationship is challenging. Two primary limitations contribute to this difficulty. First, data scarcity hinders our ability to account for factors potentially co-varying with structural transformation. Second, documentation of events surrounding structural shocks, which could offer causal insights, is often lacking. In this section, we conduct a descriptive analysis to understand the relative importance of these factors while accounting for correlations among them.

Further insights come from the Jobs of the World Dataset (JWD). The JWD dataset does not include direct measures of fertility, like the number of children born. Instead, age at first marriage is used as a close proxy, a well-established indicator of fertility potential in various settings.[31] We regress age at first marriage on the proportion of working population that works in agriculture, controlling for other factors that may also explain high fertility rates, such as the degree of urbanization, educational attainment, and national wealth distribution. We also control for regional and time trends using regional and year

as those collected by DHS, utilizing the number of births alongside the number of years of exposure (Schoumaker, 2012).

[30] See https://jwd.iza.org/#about for details. Data for Pakistan and Bangladesh was cleaned and prepared using code files provided by the JWD team.

[31] Several studies find age at first marriage to be a close predictor of total fertility, since childbearing is within marital spheres in multiple contexts. For instance, it has been identified as a key cause of high fertility in Africa and Asia (Kim et al., 1974; Sathar and Kiani, 1998; Dommaraju, 2008; Solanke, 2015).

fixed effects. Results are shown in Table 6.1. Consistent with the trends shown above, the proportion of workers in agriculture is negatively correlated with our proxy of fertility. However, the point estimate is small and insignificant, implying a weak correlation between sectoral composition and fertility within developing countries. This remains true even when we restrict the sample to South Asia, with no significant differences for Pakistan compared to its regional counterparts.

Urbanization is an important factor for age at first marriage in the sample of low-and-middle-income countries (column 1), though it is not a significant factor once we restrict the sample to only countries in Sub-Saharan Africa and Asia (columns 2 and 3). The smaller sample size likely contributes to this reduced precision. In contrast, education emerges as an important factor. Each year of schooling is correlated with a delay of 0.2 years (or a little under three months) in the age of marriage. In other words, there is clear evidence that longer schooling is correlated with a delayed age of marriage in this sample of low- and middle-income countries, which is expected to lead to lower total fertility.

Table 6.1: Correlates of age at first marriage and residents with children

	Age at 1st marriage		
	(1)	(2)	(3)
Proportion urban	1.658	1.498	1.498
	(0.538)**	(0.752)	(0.752)
Years of schooling	0.224	0.226	0.226
	(0.008)***	(0.008)**	(0.008)**
Prop. workers in agriculture	-0.630	-0.718	-0.718
	(0.443)	(0.545)	(0.545)
Prop. workers in agriculture *Pakistan			0.025
			(0.892)
Mean (sample)	20.353	20.353	20.353
Obs.	161	126	126
R^2	0.761	0.706	0.706
Regions	All	SA & SSA	SA & SSA
Countries (N)	64	46	46

Notes: The table shows results from a regression of 'Age at first marriage' on the proportion of the sample that is urban, the average years of schooling, and proportion of working force in agriculture in each sample country. 'Prop. Workers in agriculture*Pakistan' is the interaction of proportion of agricultural workers with a binary variable for if the country is Pakistan. All regressions include proxies for national wealth distribution from DHS, region and year fixed effects. Column 3 also includes a binary indicator for if the country is Pakistan. 'Mean (sample)' is the average value of the y-variable in the sample. 'Obs.' represents the number of observations. 'Regions' include East Asia and Pacific; Europe and Central Asia; Latin America and Caribbean; South Asia (SA); and Sub-Saharan Africa (SSA). 'Countries (N)' refers to the number of countries in the regression sample. The data comes from Jobs of the World Project, consisting of available Censuses (IPUMS) and Demographic and Health Surveys (DHS) for low- and middle-income countries.

Standard errors (in parentheses) are clustered by region. *** p<0.01, ** p<0.05, * p<0.1.

Insights on Potential Causal Pathways

This descriptive analysis aligns with recent empirical work emphasizing the complexity of structural change beyond the simple size of the agricultural workforce. The variables employed here, although reflecting general socioeconomic structures, can be driven by structural change or occur independently. For instance, Büttner et al. (2023) identify more nuanced factors in Africa that mediate structural change and influence fertility transition: female occupational structure, increased female earnings relative to men's, and access to secondary or higher education, equipping women for public sector or high-skilled positions.

This is also in line with recent work documenting the impact of agricultural technology and economic changes on fertility. In Brazil, for example, the introduction of genetically engineered (GE) soy increased overall household income but had a troubling effect on women. While male earnings in agriculture rose, female earnings dropped significantly as their jobs were replaced by the technology. Counterintuitively, this technology led to a rise in fertility rates (Moorthy, 2022). This might seem unusual since economic advancements often lead to fewer births. With less time spent on farm work, women's childcare time became "cheaper," making having more children more feasible. The study emphasizes that economic changes, even those promoting overall growth, can have unforeseen consequences for gender roles and family structures if they don't create new opportunities for women. Investing in female education may be crucial for creating new opportunities that can empower women to participate more fully in the transformed economy.

Why has Bangladesh experienced faster urbanization and movement out of agriculture than Pakistan? Rapid industrialization in Bangladesh has increased wages for industrial workers and encouraged a shift out of agriculture. The garment industry in particular, has grown at an explosive rate of 15.5% per year since the 1980s (Bossavie et al., 2023). In addition, labor law reforms have increased wages and improved workplace safety (Bossavie et al., 2023). Rapid industrialization, urbanization, and increased female education are likely correlated: the garment industry in Bangladesh is primarily concentrated in urban areas and attracts a large number of workers, particularly women (Saleheen et al., 1990).[32] Furthermore, evidence indicates that girls who live in villages close to garment factories are increasingly inclined to attend school once garment jobs become available, as these jobs often require literacy and numeracy skills (Heath and Mobarak, 2015). In fact, the surge in demand for education driven by the expansion of the manufacturing sector in Bangladesh seems to have a significantly greater impact on female educational achievement compared to a sizable government conditional cash transfer initiative aimed at promoting girls' schooling. Employment in the garment industry leads to delays in both marriage and childbirth for women in Bangladesh (Heath and Mobarak, 2015).

While advances in agricultural technology could potentially alleviate pressures driving high fertility rates, evidence suggests that such improvements may have limited impact in regions with low education rates. In such cases, addressing educational disparities and promoting women's economic participation may be more effective strategies for reducing fertility.

[32] The growth of industrial (manufacturing) sector in Pakistan remained stagnant during last couple of decades (see Chapter 5 of this volume by Arif, 2024).

Countries like China and South Korea saw significant fertility declines alongside rapid structural transformation. In contrast to historical trends in the West, where fertility declines typically followed the shift out of agriculture, in East Asia, fertility declines often preceded or coincided with this transition. This suggests that educational improvements, particularly for women, may be as important as or even more crucial than structural transformation alone in driving fertility change. Büttner et al. (2023) also emphasize female education as a key factor facilitating structural change and its effects on fertility, even in African contexts.

This argument is further supported by the literature. Studies by Caselli and Coleman (2001) and Buera et al. (2021) highlight the role of skill intensity in driving structural transformation, while Karachiwalla and Palloni (2019) and Porzio et al. (2022) emphasize the importance of human capital (education) in reducing reliance on agriculture. The case study in Box 1 strongly suggests a link between women's educational attainment and lower fertility in Punjab, Pakistan, indicating that education may be a robust predictor of fertility decline in this context compared to structural transformation alone.

Although structural transformation creates the necessary conditions for fertility decline by disrupting traditional models of family size, the role of education, particularly for women, appears to be a powerful mediator and driver in this transition.

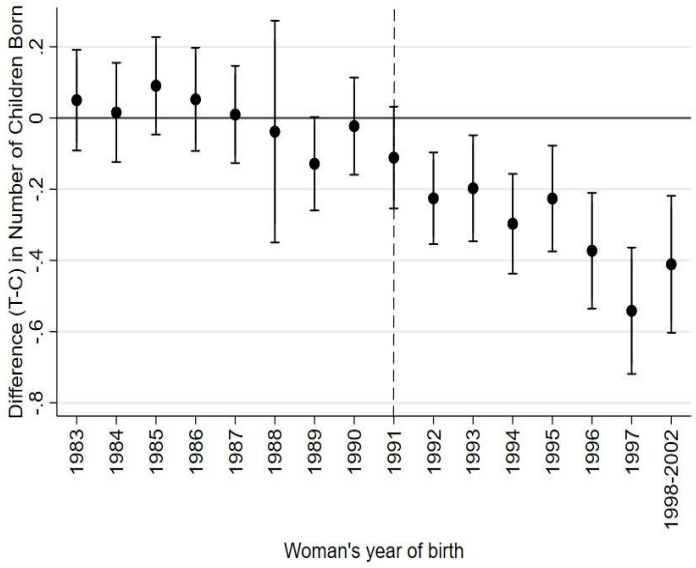
Box 1: Fertility and the Female Secondary Stipend Programme (FSSP) in Punjab, Pakistan

Since its inception in 2004, the Female Secondary Stipend Programme has provided quarterly cash stipends to girls enrolled in public schools in grades 6–10, conditional on 80% attendance. The programme operates in 15 districts of Punjab, where literacy rates were below 40% in the 1998 census. A recent quasi-experimental study found that girls in FSSP districts were more likely to finish secondary school and less likely to marry early or have early pregnancies (Musaddiq and Said, 2023).

Each year of exposure also reduced child mortality and the likelihood of children being stunted or underweight. Using the same method as Musaddiq and Said, we extended the analysis to assess whether the FSSP reduced the number of children born to women exposed. Each year of exposure decreased the number of children by 0.05 (a 2.2% reduction per year). On average, for every 19 women exposed for one year, one fewer child was born. Moreover, the impact is stronger for women with greater exposure.

The figure below shows the difference in the number of children born between women in FSSP and non-FSSP districts, with the 1991 cohort being the first exposed. For each additional year of exposure, the number of children born to eligible women in FSSP districts declines faster than in non-FSSP districts. Although the FSSP has been running for nearly two decades, most beneficiaries are still young, with an average age of 28, meaning many haven't completed their reproductive years. Interestingly, unlike the findings of Heath and Mobarak (2015), where employment prospects motivated longer schooling and lower fertility, FSSP's impact on fertility seems to be driven by improved health knowledge, greater agency, and better child health (Musaddiq and Said, 2023).

Event Study Plot: Difference-in-Difference estimates for the impact of FSSP on number of children born



Note: Author's calculation.

The figure plots difference-in-difference estimates for the number of children born to women in treatment versus comparison groups over two decades, by birth cohort. Each dot represents an estimate of the interaction term between treatment district (T) and comparison district (C) and cohort dummy, from a regression for women born between 1981–2002. Data comes from pooling four rounds of MICS from 2003 and 2018. Bars represent 95% confidence intervals. The dashed line indicates the first cohort with FSSP exposure (born in 1991).

Women's Economic Participation and Household Reproductive Choices

The relationship between female employment and fertility is complex. Traditionally, a negative association was expected—more women working meant fewer children being born. In previous decades, the majority of workers in less affluent economies were employed in agriculture, where physical labor pre-dominated and men held a significant advantage over women. As economies transitioned away from agriculture towards manufacturing and services, coupled with the growing importance of education due to technological advancements, men's comparative advantage in physical labor diminished (Roser, 2014). Consequently, women's participation in the labor force gradually increased over time. This transition aligns with the broader Unified Growth Theory (Galor, 2011). Central to this theory is the recognition that the rising demand for female labor elevated the opportunity costs associated with having children, ultimately resulting in a decline in the average number of children per woman (Galor and Weil, 1996; Angrist and Evans, 1998; Rosenzweig and Wolpin, 2000; Klerman, 1999; Levine et al., 1999; Bloom et al., 2009).

While previous research in the United States has shown a causal link between childbirth and reduced work hours for women, the situation in developing countries is more nuanced (Porter and King, 2009). There's also a long-term economic factor at play. As developing countries progress and women have more opportunities, family sizes tend to decrease. This shift is partly driven by the increasing value placed on a woman's time, which includes the time invested in raising children. Women in the developing world face a complex balancing act when it comes to family size and work decisions. Mobility limitations and the demands of childcare, especially for young children, restrict a mother's ability to participate in paid labor, both within and outside the home. At the same time, it is also likely that additional income from women working is critical for families with children, particularly when the children are too young to contribute to the labor market themselves.

Globally, there is a well-documented trend where increased female labor force participation is linked to a decrease in fertility rates (Figure 6.3).[33] A negative relationship is often attributed to the concept of opportunity cost. As women have greater access to education and jobs, the time and financial resources dedicated to childbearing become more costly. This can lead women to delay childbirth or choose to have fewer children overall.

The relationship between fertility and women's work choices is a two-way street. It's difficult to determine definitively whether having children leads women to work less, or if women who choose to work less tend to have more children. Some studies have employed innovative methods to account for these complexities, such as using the unexpected arrival of twins, miscarriages, or abortion laws, broadly concluding that having more children reduces a woman's economic participation (Angrist and Evans, 1998; Rosenzweig and Wolpin, 2000; Klerman, 1999; Levine et al., 1999). Others have used event study and experimental designs with long-term data to document increasing female labor force participation and reducing desired and actual family sizes (Sivasankaran, 2014; Van den Broeck and Maertens, 2015). In both cases, women's economic participation and fertility rates seem

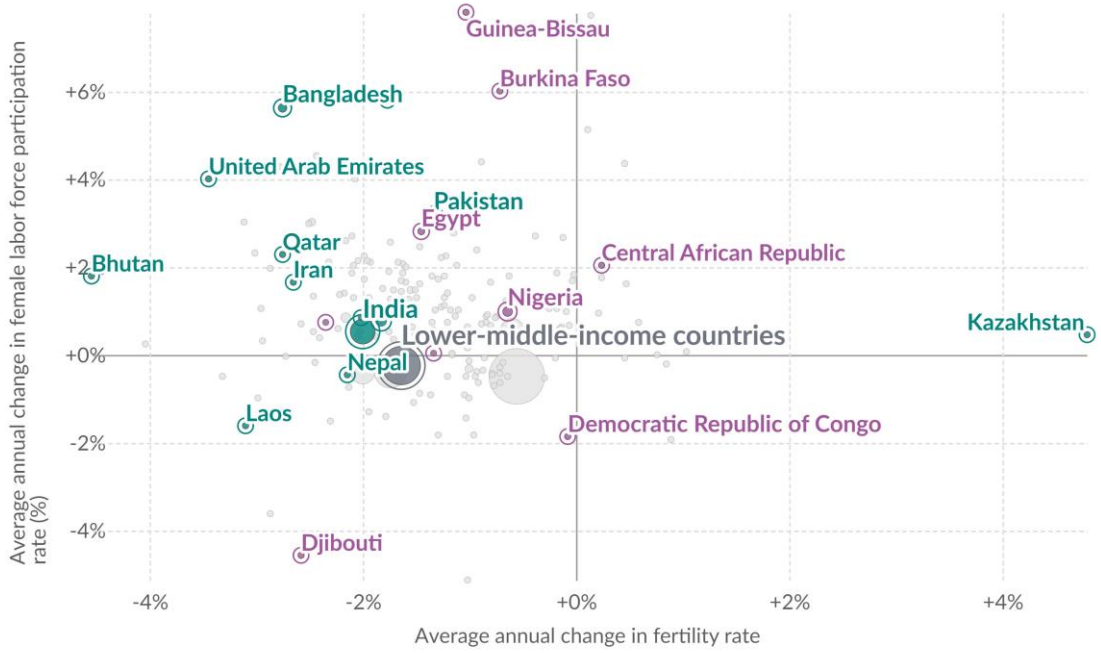
[33] On average, as female labor force increases, fertility rates decline. However, the average correlation is weaker in low-and-middle-income or developing countries.

to have a negative relation—fertility rates decrease when women's participation in the labor force increases, and vice versa.

Insights from Data

Pakistan presents a complex case in this interplay between female economic participation and fertility rates. Though the current female labor force participation rates in India and Pakistan are similar, the female participation rate was much lower in Pakistan 50 years ago than it is now. This results in a stronger negative association between fertility rates and women's economic participation in Pakistan compared to India (Figure 6.3). At the same time, Pakistan has not had as rapid a decrease in fertility or as significant an increase in female labor force participation rates as Bangladesh. Pakistan's growth in female labor force participation and its decline in fertility have not kept in pace with Bangladesh, stopping short on both cases.

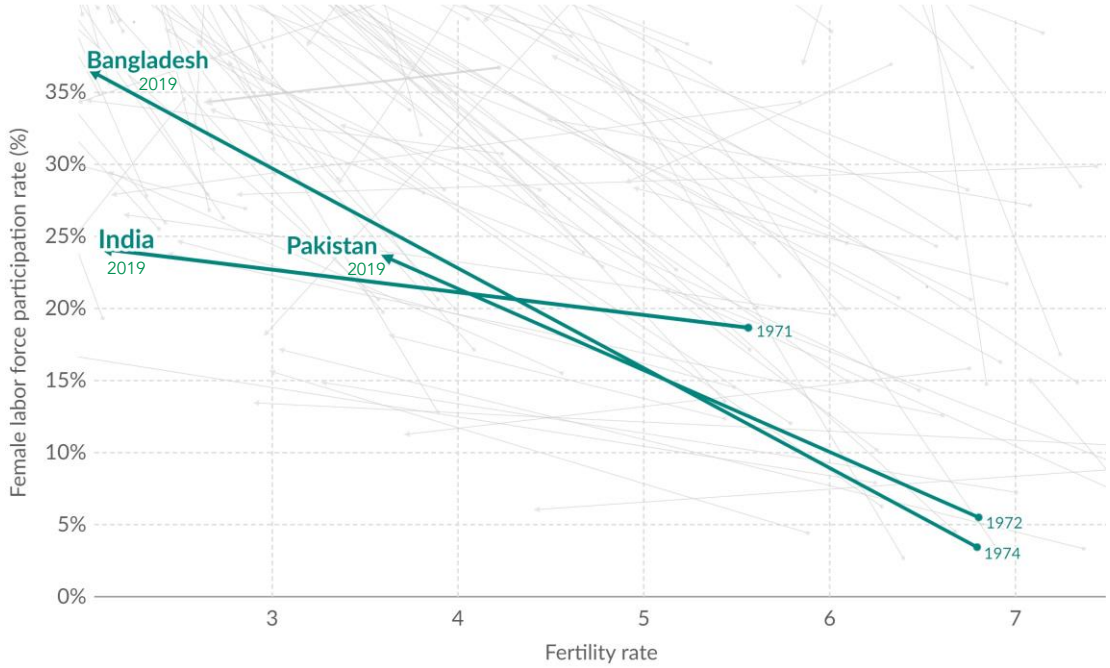
Figure 6.3: Average change in fertility rate and female labor force participation, 1971–2019



Data source: International Labor Organization (via World Bank); UN, World Population Prospects 2022. OurWorldinData.org/female-labor-force-participation-key-facts | CC BY.

Circles denote countries (including gray circles in the background) globally, sized by population historical estimates. Total fertility rate is a period metric, across all ages for a specific year, representing the average number of children that would be born to a hypothetical woman if she (1) lived to the end of her childbearing years, and (2) experienced the same age-specific fertility rates throughout her reproductive life as the age-specific fertility rates seen in that particular year. The labor force participation rate is the share of the population aged 15 or older who are economically active. Average annual change in the female labor force participation rate between 1971 - 2019 (for years data is available) are plotted on the y-axis. The x-axis plots the average annual change in fertility rate for each country between 1971 and 2019.

Figure 6.4: Fertility rate and female labor force participation, 1971–2019



Note: Data source: International Labor Organization (via World Bank); UN, World Population Prospects 2022. OurWorldinData.org/female-labor-force-participation-key-facts | CC BY.
The graph plots the average change over time in fertility rates and female labor force participation rates. Note, this plots overall change over the last 50 years, not regression or linear-fit. Circles denote countries (including gray circles in the background) globally, sized by population historical estimates. Total fertility rate is a period metric, across all ages for a specific year, representing the average number of children that would be born to a hypothetical woman if she (1) lived to the end of her childbearing years, and (2) experienced the same age-specific fertility rates throughout her reproductive life as the age-specific fertility rates seen in that particular year. The labor force participation rate is the share of the population aged 15 or older who are economically active. The female labor force participation rate between 1971–2019 (for years data is available) are plotted on the y-axis. The x-axis plots the fertility rate for each country between 1971 and 2019.

The literature points towards four main factors that contribute to this disconnect in Pakistan. First, data does not fully reflect female economic participation in the informal sector, which is likely higher than formal participation, but also tends to consist of low-paying, precarious jobs. These jobs may not provide the same level of improvement in household income or the high opportunity costs of a woman's labor that would encourage a reduction in desired fertility. The share of unpaid family helpers is also much higher among the female labor force than among their male counterparts.

Second, recent evidence points towards gender preferences keeping desired fertility high (Porter and King, 2009). Unlike in developed countries, women in developing nations like Pakistan make decisions about having children and working based on the number of children who survive rather than the total number born. This is because child mortality rates are still high in these countries. Since sons are more likely to die young in some places like Pakistan, women might have more children overall, hoping for at least one surviving son (Porter and King, 2009). Using multiple births as an exogenous shock on family size and gender mix in the family, Porter and King (2009) find that son preference is a significant factor in South Asia, unlike other developing regions with higher male mortality. Women might have additional children initially to ensure at least one surviving son,

which can create a situation where even women in the workforce prioritize having children over other pursuits (Roser, 2014).

Third, recent work has highlighted how decent work opportunities can motivate women to join (and stay) in the labor market, reducing desired fertility. For instance, in India, Sivasankaran (2014) examines how factory jobs in rural India affect young women's marriage and fertility decisions. It's difficult to isolate the true effects of working on fertility choices because women who choose these jobs might already be different from those who don't. Sivasankaran (2014) leverages a shift in a textile company's contracts, leading to a switch from fixed-term contracts with a bonus for completion to daily wage contracts. In a sample of nearly 900 women, this unexpected change led to women staying at work longer, marrying later, and wanting fewer children in the future. Importantly, these women don't seem to have any trouble finding husbands, and the quality of the men they marry isn't affected. The study suggests that working in factories and earning a stable income empowers women and gives them more autonomy, which may explain the observed effects. In another study in India, young women from randomly selected villages received three years of recruiting assistance, resulting in an exogenous change in their labor participation (Jensen, 2012). In response to this intervention, young women opted to either join the labor force or pursue additional education, both of which contributed to them postponing marriage. Notably, married women expressed a desire for fewer children. Similarly, in Senegal, an increase in female employment due to a boom in horticulture exports led to delayed childbirth and ultimately fewer children overall (Van den Broeck and Maertens, 2015).

The fourth factor, and one that is perhaps the most stubborn to change, is societal norms. Despite a half-century of societal evolution, South Asian women have experienced limited progress or even regression in various norms-sensitive areas, including labor force participation, age at first birth, and agency (Bussolo et al., 2023). Economic development, despite strong growth in the region, has failed to substantially improve gender disparities. Using cohorts of adults interviewed in the World Values Surveys, Bussolo et al. find that conservative gender attitudes have remained largely unchanged or have become even more entrenched between cohorts born in the 1940s and cohorts born in 1990s, encompassing views on women's education and contribution to household income. In Pakistan, men's support for female labor force participation is more predictive of women's workforce involvement than women's own opinions. Household and childcare duties are commonly cited reasons for women's non-participation in the workforce, a trend that has persisted largely unchanged over the past 15 years in Pakistan (Amir et al., 2018). Higher incomes and urbanization do not appear to have the expected positive influence on norm-sensitive women's outcomes (Bussolo et al., 2023). Addressing these entrenched inequalities will require concerted efforts to challenge and transform conservative social norms alongside policy and economic initiatives.

Therefore, while the global trend suggests a connection between female economic participation and lower fertility rates, there is a weak association in the specific context of Pakistan. Until women in Pakistan have greater access to decent work, childcare, and evolving cultural norms around childbearing, it is unlikely that female labor force participation alone will significantly impact fertility rates.

Conclusion: Revisiting Fertility Transition

Pakistan faces a demographic challenge as its fertility rate remains high despite declining mortality, resulting in rapid population growth. If current policies continue unchanged, the Total Fertility Rate (TFR), under the Business as Usual (BaU) scenario, is likely to be 2.5 by 2050, well above the replacement level (KC et al., 2024).

This chapter explored the role that stalled sectoral transformation and maternal education may have had in the lack of fertility transition. Traditional theories hypothesize that a shift from agriculture to non-agriculture disrupts traditional family structures, increasing the opportunity costs of not working for women and decreasing the gains from child labor. Our analysis of the regions shows a weak association at best, suggesting that while structural transformation may be important for fertility decline, it may not be sufficient in the absence of other factors.

Specifically, maternal education is an important factor. Our findings suggest a negative correlation between TFR and female education. In addition, evidence from Punjab indicates that even in the absence of sectoral transformation, maternal education may have delayed marriage, improved child health, and reduced family sizes. These findings resonate with the Beckerian "quality vs. quantity" trade-off, with educated women prioritizing healthier, well-educated children over a larger family size. Taken together, insights from empirical literature and our own analysis indicate that while structural transformation creates necessary conditions by disrupting traditional models of family size, education, particularly for women, can be a powerful driver in this transition. The East Asian context exemplifies this, where educational expansion has coincided with, or even preceded, fertility decline. Further empirical research is needed to explore these nuances across different contexts and identify the specific mechanisms through which education influences fertility decisions. Understanding this dynamic relationship between quantity and quality decisions offers valuable insights for policymakers aiming to foster sustainable development pathways in contexts like Pakistan.

In particular, we offer the following key insights for charting the way forward:

- **First, prioritizing investments in education, especially for women, is a key strategy for promoting fertility decline.** Education enables women to transition out of primarily agriculture-based work, giving them greater access to employment opportunities outside of the agricultural sector. In addition, education improves agency and health knowledge, which enhances child health. These two forces have the potential to reduce both desired and actual family size. This argument is supported by research in Asia that highlights the importance of educational attainment in driving fertility decline.
- **Second, while a negative association between women working and fertility rates is observed globally, the labor force participation rates in Pakistan have remained stable at under 25%.** Much of female economic activity occurs in the informal sector, offering low wages and limited opportunity costs compared to formal employment. Evidence suggests that decent work—characterized by a safe work environment and competitive pay—can have a meaningful influence on reducing fertility.

- **Third, the lack of access to affordable education and healthcare, particularly for girls, reduces investment in children.** Evidence suggests that supporting educational costs can reduce the reliance on children to work. Lessons from the Sub-Saharan experience indicate that government pensions could become a powerful tool for reducing reliance on large families as an insurance-mechanism, thereby reducing desired family size. This would require further research and careful policy design, but the potential benefits are significant.

In conclusion, our analysis highlights the importance of taking a holistic approach that acknowledges the interconnected nature of economic, social, and demographic factors in shaping fertility dynamics. Policymakers need to create broad interventions that address not just structural obstacles but also societal and cultural norms, as well as institutional limitations that could impede both educational achievement and decreases in fertility rates. By prioritizing education in facilitating sectoral transformation and recognizing the interconnected nature of economic and demographic concerns, meaningful progress can be made in addressing declining fertility rates.

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Appendix

Table A1: List of countries with DHS rounds (years) included in the analysis with JWD dataset

Sr. No	Region	Country	DHS rounds
1	East Asia and Pacific	Cambodia	2005, 2010, 2014
2	East Asia and Pacific	Myanmar	2015
3	East Asia and Pacific	Papua New Guinea	2016
4	East Asia and Pacific	Philippines	2003
5	East Asia and Pacific	Timor-Leste	2009, 2016
6	Europe and Central Asia	Albania	2008, 2017
7	Europe and Central Asia	Armenia	2000, 2005, 2010, 2015
8	Europe and Central Asia	Azerbaijan	2006
9	Europe and Central Asia	Kazakhstan	1999
10	Europe and Central Asia	Kyrgyzstan	2012
11	Europe and Central Asia	Moldova	2005
12	Europe and Central Asia	Ukraine	2007
13	Latin America and Caribbean	Bolivia	1998, 2003, 2008
14	Latin America and Caribbean	Brazil	1996
15	Latin America and Caribbean	Colombia	2015
16	Latin America and Caribbean	Dominican Republic	1996, 2002
17	Latin America and Caribbean	Guatemala	2014
18	Latin America and Caribbean	Guyana	2009
19	Latin America and Caribbean	Haiti	1994, 2000, 2005, 2012
20	Latin America and Caribbean	Honduras	2011
21	Latin America and Caribbean	Nicaragua	1997
22	Latin America and Caribbean	Peru	1996
23	South Asia (SA)	Bangladesh	1996, 2004
24	South Asia (SA)	India	2005, 2015
25	South Asia (SA)	Maldives	2016
26	South Asia (SA)	Nepal	2011, 2016
27	South Asia (SA)	Pakistan	1990, 2012, 2017
28	Sub Saharan Africa (SSA)	Angola	2015
29	Sub Saharan Africa (SSA)	Benin	2001, 2006, 2011, 2017
30	Sub Saharan Africa (SSA)	Burkina Faso	1998, 2003, 2010
31	Sub Saharan Africa (SSA)	Burundi	2010, 2016
32	Sub Saharan Africa (SSA)	Cameroon	1998, 2004, 2011, 2018
33	Sub Saharan Africa (SSA)	Central African Republic	1994
34	Sub Saharan Africa (SSA)	Chad	1996, 2004, 2014

Continued on next page

Sr. No	Region	Country	DHS rounds
35	Sub Saharan Africa (SSA)	Comoros	1996, 2012
36	Sub Saharan Africa (SSA)	Congo	2005, 2011
37	Sub Saharan Africa (SSA)	Congo DR	2007, 2013
38	Sub Saharan Africa (SSA)	Cote d'Ivoire	1994, 1998, 2011
39	Sub Saharan Africa (SSA)	Eswatini	2006
40	Sub Saharan Africa (SSA)	Ethiopia	2000, 2005, 2010, 2016
41	Sub Saharan Africa (SSA)	Gabon	2000, 2012
42	Sub Saharan Africa (SSA)	Gambia	2013, 2019
43	Sub Saharan Africa (SSA)	Ghana	1993, 1998, 2003, 2008, 2014
44	Sub Saharan Africa (SSA)	Guinea	1999, 2005, 2012, 2018
45	Sub Saharan Africa (SSA)	Kenya	1998, 2003, 2008, 2014
46	Sub Saharan Africa (SSA)	Lesotho	2014
47	Sub Saharan Africa (SSA)	Liberia	2006, 2013, 2019
48	Sub Saharan Africa (SSA)	Madagascar	2003, 2008
49	Sub Saharan Africa (SSA)	Malawi	2000, 2004, 2010, 2015
50	Sub Saharan Africa (SSA)	Mali	1995, 2001, 2006, 2012, 2018
51	Sub Saharan Africa (SSA)	Mozambique	1997, 2003, 2011
52	Sub Saharan Africa (SSA)	Namibia	2000, 2006, 2013
53	Sub Saharan Africa (SSA)	Niger	1998, 2006, 2012
54	Sub Saharan Africa (SSA)	Nigeria	2003, 2008, 2013, 2018
55	Sub Saharan Africa (SSA)	Rwanda	2000, 2005, 2010, 2014, 2019
56	Sub Saharan Africa (SSA)	Sao Tome and Principe	2008
57	Sub Saharan Africa (SSA)	Senegal	2005, 2010, 2017, 2018, 2019
58	Sub Saharan Africa (SSA)	Sierra Leone	2008, 2013, 2019
59	Sub Saharan Africa (SSA)	South Africa	2016
60	Sub Saharan Africa (SSA)	Tanzania	1991, 1996, 1999, 2004, 2009, 2015
61	Sub Saharan Africa (SSA)	Togo	1998, 2013
62	Sub Saharan Africa (SSA)	Uganda	2000, 2006, 2011, 2016
63	Sub Saharan Africa (SSA)	Zambia	1996, 2001, 2007, 2013, 20184
64	Sub Saharan Africa (SSA)	Zimbabwe	1994, 1999, 2005, 2010, 2015

Note: This table lists the countries and survey years included in the analysis in Table 1. Data for Pakistan and Bangladesh was added by authors using code provided by the JWD team. No other changes have been made to the data created by JWD. Bangladesh DHS 2007 and 2011 rounds do not contain questions used to create proportion of workers in agriculture used for other years and countries.

CHAPTER 7

Climate Change and Population Dynamics in Pakistan

Heman Das Lohano

Introduction

Pakistan has been identified as one of the countries experiencing high risks of climate change impacts, coupled with high population growth and high fertility rates. It is recognized as one of the most vulnerable nations to climate change globally (UNDP, 2015). According to the Global Climate Risk Index 2021 report, Pakistan ranks eighth among the most affected countries in terms of extreme weather events during the period 2000–2019 (Eckstein et al., 2021). Additionally, Pakistan is the fifth most populous country globally, with a fertility rate of 3.5, significantly higher than the average rates of 2.24 in South Asia and 2.27 worldwide (World Bank, 2023). A study by Sathar and Khan (2019) explored the impacts of climate change, exposure, and vulnerability across different zones in Pakistan, along with implications for migration as an adaptation strategy. However, little empirical evidence has been produced examining the linkages between climate change and population dynamics.

This study aims to examine the interplay between climate change and population dynamics. Its objective is to conduct an informed and evidence-based analysis of these interlinkages, providing valuable insights for policymakers in developing policies for reducing population growth and addressing climate change in Pakistan. The study employs a combination of descriptive statistics, trend analysis, household-level data analysis, and literature review to achieve its objectives.

Pakistan's high fertility rates, particularly in low-income households, render it vulnerable to the challenges posed by climate change. Consequently, human capital development becomes challenging for these households, making it difficult to realize demographic dividends. The objectives of this study are to:

1. Broaden and deepen understanding across a wide range of population-climate change linkages.
2. Review population trends and future prospects in assessing their implications for environmental sustainability and climate change.
3. Provide evidence-based perspective on how population dynamics, including migration, can inform climate change responses, including both mitigation and adaptation.
4. Identify gaps, issues, challenges, and areas for policy reform.
5. Conduct econometric analysis to examine the impacts of climate change.
6. Provide policy recommendations.

The key research questions which this study addresses are:

1. Do population growth rates and size matter for climate change-impacted countries like Pakistan?
2. What are the pathways through which demographic trends contribute to the impact of climate change?
3. What are the effects of climate change on out-migration?

Evidence on Linkages between Climate Change and Population

This section reviews global literature on linkages between climate change and population.

Lower Population Growth as a Climate Mitigation Policy

The effect of population on the environment has been recognized for a long time. Ehrlich and Holdren's (1971) pioneering work introduced a foundational model recognizing the impact of population on the environment. This model evolved into the IPAT framework, positing that environmental impact (I) is the product of three key factors: population (P), affluence (A), and technology (T) (Ehrlich & Holdren, 1972). The application of IPAT to greenhouse gas (GHG) emissions is referred to as Kaya identity, which states that total emissions are the product of four factors: human population, GDP per capita, energy intensity, and carbon efficiency (Kaya and Yokobori, 1997). This model shows that the human population has a positive impact on total emissions. If the emissions per capita remain unchanged, then total emissions per time period would increase with an increasing population. Thus, managing the human population is an approach to reduce emissions.

There have been numerous empirical studies on measuring the impact of population size on emissions. O'Neill et al. (2012) reviewed studies from different countries and found that a one percent increase in the population would result in a one percent increase in CO2 emissions. Martínez-Zarzoso (2007) found that the elasticity of the impact of population growth on emissions is significant and more than one percent for new European Union member countries, while it is non-significant and less than one percent for old European Union member countries. Iwejingi (2013) conducted a descriptive analysis and showed that population growth causes climate change through increasing activities including agriculture cultivation, deforestation, oil extraction, increasing automobiles, and creating waste.

There have been various studies on the effects of reducing fertility rates and emissions. Speidel (2015) demonstrates that reducing population growth is a cost-effective approach to resolving issues of food security and climate change, finding that a decrease in fertility rates would lead to less intense global climate change. Wheeler and Hammer (2010) also find that investing in population policies is a cost-effective approach for reducing CO2 emissions compared to other approaches, including using biofuels, solar, and wind as sources of energy. Budolfson and Spears (2020) state that it is desirable to reduce the fertility rate by promoting reproductive health care, education, and social equality. However, they argue that reducing fertility has minimal effects on emissions but should not be used as a substitute for other climate mitigation policies.

Starbird, Norton, and Marcus (2016) explored the linkages between family planning—including services, policies, and access to contraceptives—and the attainment of Sustainable Development Goals (SDGs), including the goal on climate change. Casey and Galor (2017) demonstrate that fertility rates affect carbon emissions through three channels: total population, the age structure of the population, and economic output. They find that a decrease in fertility rates would reduce CO2 emissions and increase per capita income. They estimate that moving from the medium to the low variant of the UN fertility projection leads to 35% lower annual emissions and 15% higher per capita income by the end of this century.

Loss and Damages with Population Growth

If there are more people in the future due to population growth, then a greater number of people will be exposed to climate-induced damages. Thus, the loss and damage from carbon emissions would be larger if population growth is accounted for, and the optimal level of current carbon emissions should be lower (Budolfson and Spears 2020). Scovronick et al. (2017) and Budolfson et al. (2018) show that if climate-induced damages are considered due to relatively higher fertility rates, this would have important implications for reducing emissions as a climate mitigation policy.

Climate justice recognizes the development paradox that those who contributed least to greenhouse gas emissions are most affected by climate change. The literature states that emissions are produced by people in the richest countries, and industrial development and consumption patterns in the Global North are primarily responsible for the crisis we are in today, and thus are responsible for reducing emissions and financing loss and damages.

Lower Fertility Rates as Climate Adaptation Policy

There have been studies that argue that if climate-induced damages are considered, decreasing fertility is a potential adaptation policy. Dodson et al. (2020) state that decreasing fertility rates holds significant potential for mitigating the impacts of climate change, and policymakers should prioritize this strategy when designing policies to combat climate disruption and reduce its consequences. Asefi-Najafabady et al. (2018) examine human exposure to extreme heat and assert that the interaction between climate and population often serves as the primary driver of future exposure, surpassing the effects of climate or population changes individually.

Previous studies have pointed out that there are uneven impacts of climate change. Bryant (2009) investigated the impacts of climate change across countries and concluded that developing nations would be disproportionately affected. The study also suggests that family planning initiatives could potentially alleviate these impacts, particularly if access to family planning services improves in impoverished communities in the least-developed countries. Hall et al. (2017) demonstrate that projected rapid population growth will be a leading contributor to food insecurity and widespread undernourishment across Africa. Dawson et al. (2016) highlight the adverse effects of rapid population growth coupled with global climate change, predicting significant negative impacts on food security.

Moreland and Smith (2013) observe that the issue of food security may worsen with climate change in Ethiopia but could diminish with lower population growth rates. Their study estimates that by

2050, slower population growth could entirely offset the effects of climate change on food insecurity. Ahmadalipour et al. (2019) find that sustainable population growth is relatively more effective than implementing climate change mitigation measures for reducing drought risk in Africa, as it improves socioeconomic vulnerability and reduces potential exposure to drought. Jones et al. (2018) demonstrate that a lower population pathway leads to a reduction in exposure of roughly one-third relative to the higher growth pathway. Lutz (2009) states that strengthening human capacity, primarily through education, which in turn reduces population growth and enhances economic growth, is the most promising investment for adapting to the impacts of climate change.

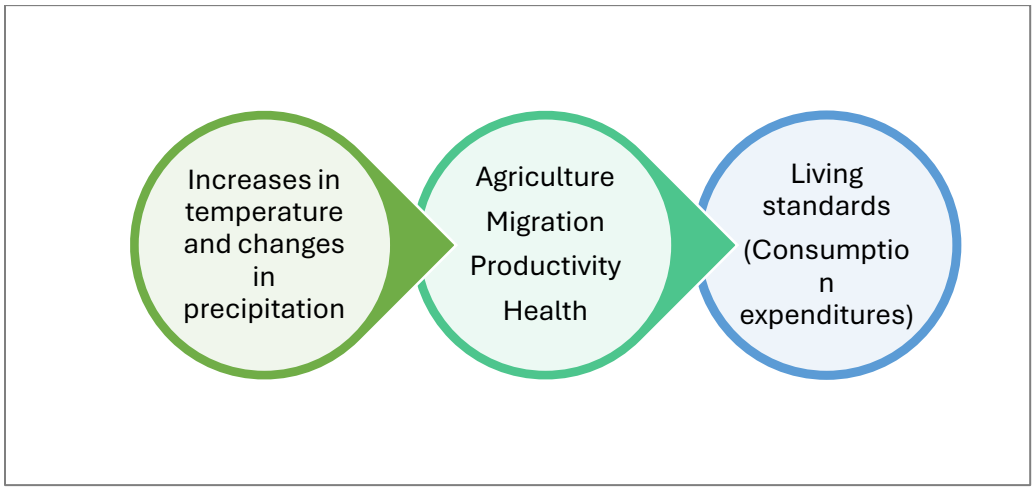
Examining the importance of interaction between climate change and population growth, Smirnov et al. (2016) find that climate change and population growth account for 60% and 9% of drought exposure, respectively, while their interaction accounts for 31% of the exposure. Drought exposure would be experienced by 129 countries due to climate change alone, by 23 countries due to population growth alone, and by 38 countries due to the interaction between climate change and population growth.

Many studies have been conducted to examine the impacts of climate change through different channels. The diagram in Figure 1 illustrates how rising temperatures and changing precipitation patterns impact living standards through a variety of channels. Firstly, these climate changes directly affect agriculture, migration, productivity, and health, all of which are crucial to economic growth and poverty reduction.

In the context of health, increased temperatures can facilitate the spread of vector-borne and other infectious diseases, negatively impacting public health by reducing productivity and income. Additionally, climate change affects agricultural productivity. In warmer climates, crop yields may decline, leading to a reduction in living standards for households that rely on agriculture. Conversely, historically colder regions might experience a boost in productivity due to warmer temperatures.

Moreover, climate changes can force individuals to migrate from their traditional professional domains, often resulting in lower income as people leave familiar work environments. Productivity is also affected by extreme heat days, which are generally associated with lower worker output, particularly in already warm areas. This decline in productivity can hinder overall economic growth and efforts to reduce poverty.

Figure 7.1: Impacts of climate change through different channels



Source: Mani et al. (2018).

Effects of Climate Change on Mortality and Fertility

Climate change directly through temperature or indirectly through disease, drought, and other mechanisms, could affect mortality rates and fertility rates (Budolfson and Spears, 2020). The effect of temperature on mortality has been studied in various works (e.g., Barreca et al., 2016; Geruso and Spears, 2018). Sherwood and Huber (2010) argue that humans have limits on adaptation to temperature and thus continuous skin temperature above 35 °C is intolerable. The combination of heat and humidity has a greater effect on human compared to heat or humidity alone. Sobolewski et al. (2020) find that humans can manage some physical activity when the weather is hot and dry. However, when the weather is hot and humid, it becomes more problematic as the surrounding environment inhibits the evaporation of sweat, which, in turn, prevents the lowering of body temperature. Another study found that climate change might also increase the variance in the size of the future population (Spears, 2015).

National Climate Change Policy and Population Growth in Pakistan

In this section, we review the existing climate change policies of Pakistan in the context of population growth.

To address climate change, Pakistan formulated the National Climate Change Policy in 2012 and also developed a framework for implementation of the National Climate Change Policy in 2013 (Government of Pakistan, 2012; 2013). In 2017, the Ministry of Climate Change in the federal government was formed following the Pakistan Climate Change Act, 2017. In 2021, the National Climate Change Policy was updated (Government of Pakistan, 2021).

The national climate policy document provides a policy framework for achieving climate-resilient development with specific objectives, including sustainable economic growth that accounts for

climate change, integration of climate policy with other related sectors' policies, promoting pro-poor, gender-sensitive adaptation, and cost-effective mitigation measures, and ensuring water security, food security, and energy security, considering the impacts of climate change among other objectives for climate resilient development.

The updated National Climate Change Policy of 2021 underscores the imperative of implementing a robust population management program. According to the policy document, given Pakistan's rapidly growing population, especially among those living below the poverty line, there is a pressing need for renewed efforts to engage local communities in population management programs and sustainable natural resource management. As part of comprehensive training and education initiatives aimed at fostering economic well-being, the policy advocates for the following measures: ensuring the effective implementation and expansion of national population planning strategies and programs, given the potential exacerbation of climate change impacts due to population explosion; raising general awareness about the ramifications of unchecked population growth and its strain on natural resources; and enhancing the resilience of vulnerable communities to climate-related risks through the implementation of community-level adaptation measures. These steps are crucial for equipping communities with the necessary tools to manage natural resources efficiently in the face of climate change challenges.

Climate Change Projections

Climate change poses significant challenges to populations worldwide, including in Pakistan (Khine & Langkulsen, 2023). Pakistan faces rates of warming considerably above the global average (World Bank, 2021). Rising temperatures and changing precipitation patterns can have profound effects on human health, agriculture, and water resources (Syed et,al 2022). Heatwaves, droughts, and floods are expected to become more frequent and intense, posing risks to food security, water availability, and public health (Mirzabaev, 2023). These impacts will disproportionately affect vulnerable communities, exacerbating existing socio-economic disparities. Adaptive measures and mitigation strategies are essential to safeguard human wellbeing and resilience in the face of these climate-related challenges.

Table 7.1 presents the projected changes in climate indicators for Pakistan across different scenarios and time periods. The scenarios are Shared Socioeconomic Pathways (SSPs), which are designed to provide an understanding of future climate conditions according to specified emissions, efforts to mitigate climate change, and various development trajectories. The very high emissions scenario is denoted by SSP5-8.5, the high emissions scenarios is denoted by SSP3-7.0, the intermediate emissions scenario is denoted by SSP2-4.5, and the low emissions scenario is denoted by SSP1-2.6. These indicators are crucial for understanding future climate risks and potential impacts due to changing environmental conditions. Table 7.1 shows the mean projections of average daily temperature and annual precipitation for two time periods 2040–2059 and 2080–2099, with reference to the baseline period 1995–2014. The values represent the projected anomaly compared to the reference period. Temperature anomalies are shown in degrees Celsius (°C), providing insight into how future climate scenarios may deviate from historical norms.

Table 7.1: Projected of change in mean surface air temperature and precipitation

	Future Climate Scenarios			
	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
Projected Change in Temperature (°C)				
2040–2059	1.34	1.63	1.69	2.20
2080–2099	1.49	2.67	3.75	5.14
Projected Change in Precipitation (%)				
2040–2059	39.53	28.04	37.14	31.76
2080–2099	22.18	29.91	73.16	71.29

Source: Climate Change Knowledge Portal (World Bank, 2024).

Projections in Table 7.1 show that the average temperature is expected to exceed 1.5 degrees Celsius (°C) in all scenarios except the low-emission scenario. This highlights the uncertainty of future climate conditions, which are heavily dependent on global emissions decisions made by numerous countries. Given this uncertainty, it is imperative for Pakistan to proactively develop and implement a comprehensive climate change adaptation policy. Such a policy should encompass a range of measures, including enhancing climate-resilient infrastructure, improving natural resource management, promoting sustainable agricultural practices, and, crucially, lowering the fertility rate to reduce population pressure on natural resources. By preparing for various climate outcomes, Pakistan can better safeguard its population and ecosystems against the adverse impacts of climate change.

Climate Change and Population: Insights from Trends Analysis

This section presents the descriptive statistics and trend analysis on indicators of climate change, population growth, fertility rate, emissions, climate change impacts, and coastal erosion in Pakistan.

Natural Hazards and Exposure

Pakistan faces some of the highest disaster risk levels in the world, ranked 13 out of 191 countries in terms of the hazards and exposure, as reported by the 2024 Inform Risk Index report (INFORM, 2024). Pakistan also has high exposure to flooding, including riverine, flash, and coastal floods, as well as some exposure to tropical cyclones and their associated hazards, and drought.

Table 7.2 presents the number of incidents and people affected by key natural hazards in Pakistan from 1981 to 2020, showing data on flood, earthquakes, droughts, storms, extreme temperatures, and landslides. In terms of the number of incidents, flood accounts for 50% of total natural hazards during this period. However, in terms of number of people affected, floods accounts for 79%. Earthquakes and droughts account for 8.7% and 8.14%, respectively, in terms of the number of people affected.

Pakistan faces different types of natural hazards almost every year. Figure 7.2 shows the types of natural hazards in each year, while Figure 7.3 presents the number of people affected by floods and other natural hazards, including earthquakes, droughts, storms, extreme temperatures, and

landslides, from 1981 to 2020. Throughout this period, Pakistan has experienced both major and minor floods with considerable frequency, and the data clearly shows that floods have had a significant and recurring impact on the population. Notably, there are several peaks in the blue line indicating years where flood-related impacts were particularly severe, such as in the early 1990s, mid-2000s, and early 2010s. These peaks highlight specific events where millions of people were affected by flooding. Overall, these figures show an increasing trend in exposure to floods in Pakistan.

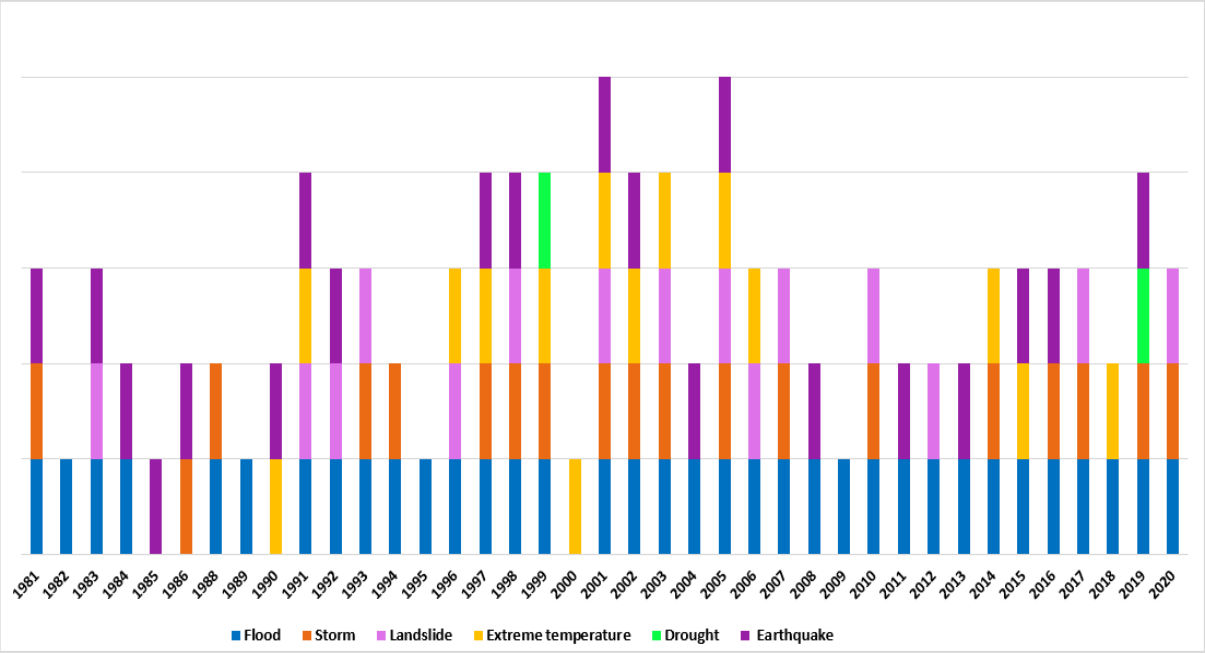
The above analysis is based on data from 1981 to 2020. After 2020, Pakistan has continued to face significant natural hazards, particularly floods. Between June and August 2022, torrential rains and a combination of riverine, urban, and flash flooding led to an unprecedented disaster in Pakistan. According to the National Disaster Management Authority (NDMA), around 33 million people were affected by the floods, including nearly 8 million displaced. The floods have claimed the lives of more than 1,700 people, one-third of whom were children (Government of Pakistan, 2023).

Table 7.2: Number of incidents and people affected by key natural hazards in Pakistan, 1981 to 2020

Natural Hazard	Number of incidents	Percent	Number of people affected	Percent
Flood	92	50.27	66,997,077	79.25
Earthquake	29	15.85	7,355,586	8.70
Drought	2	1.09	6,880,912	8.14
Storm	23	12.57	3,194,915	3.78
Extreme temperature	15	8.20	80,574	0.10
Landslide	22	12.02	34,154	0.04
Total	**183**	**100.00**	**84,543,218**	**100.00**

Source: Author's computations using data from Climate Change Knowledge Portal (World Bank, 2024).

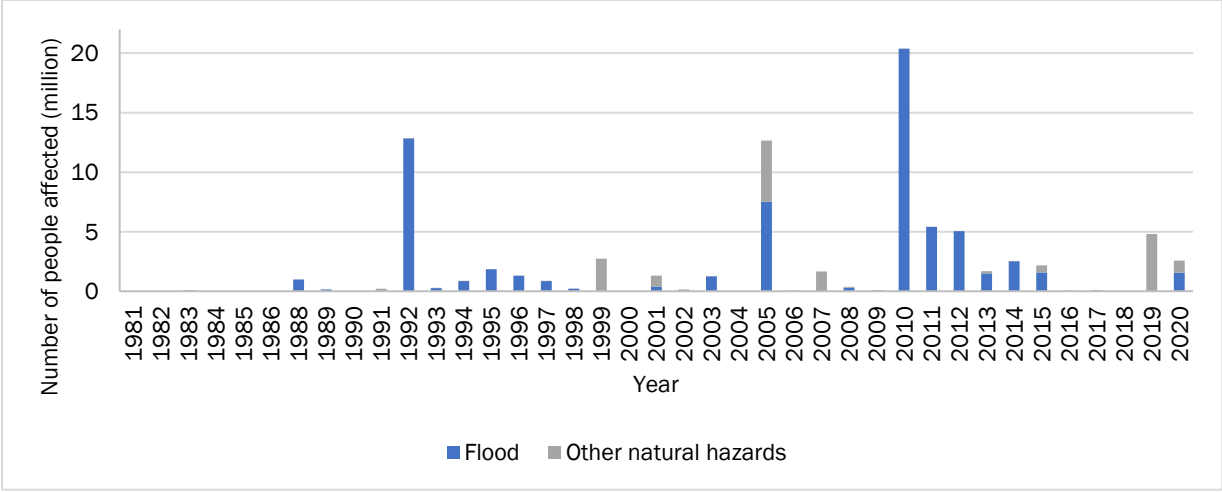
Figure 7.2: Key natural hazards in Pakistan from 1981 to 2020



Note: This figure shows only the types of natural hazards in each year while Figure 7.3 presents the number of people affected.

Source: Developed by author using data from Climate Change Knowledge Portal (World Bank, 2024).

Figure 7.3: Number of people affected by flood and other natural hazards in Pakistan from 1981 to 2020



Source: Data from Climate Change Knowledge portal (World Bank, 2024).

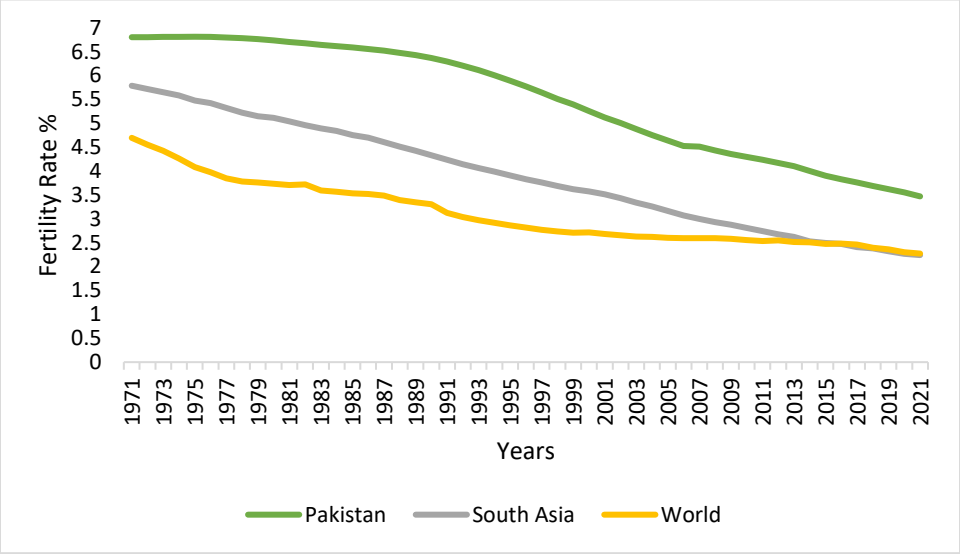
Note: Other natural hazards include earthquakes, droughts, storms, extreme temperatures, and landslides.

Population Growth and Fertility Rates

Pakistan was ranked the 10th most populous country in the world in 1971. By 2022, it had been the 5th most populous country globally. This shift is mainly due to high population growth rates and high fertility rates in Pakistan. Figure 7.4 shows a comparison of fertility rates among Pakistan, South Asia, and the world. Figure 7.5 presents a comparison of fertility rates among South Asian countries. These figures clearly indicate that the fertility rate in Pakistan continues to be higher than the world average and South Asian average. Furthermore, Pakistan's fertility rate is the second highest in South Asian countries following Afghanistan.

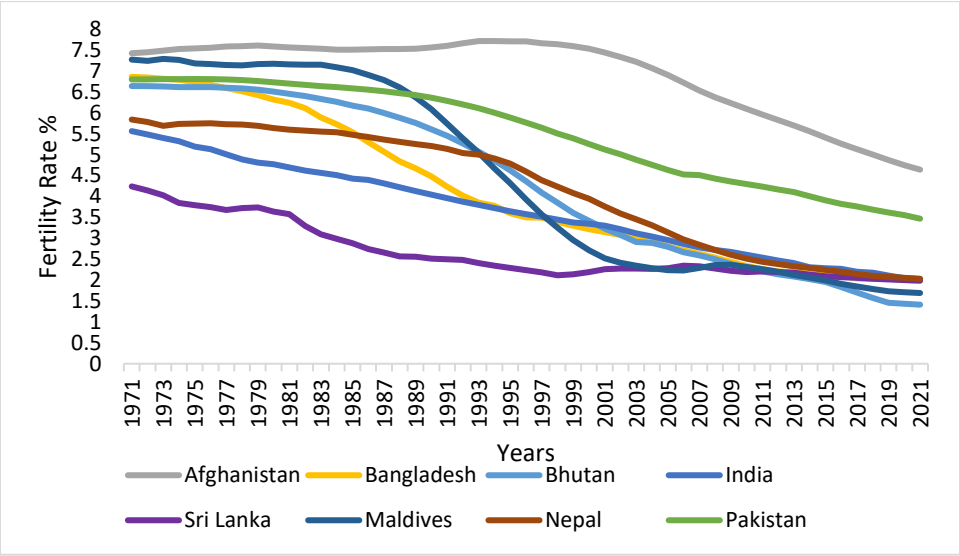
Statistics from the Pakistan Demographic Health Survey of 2017–2018 show that the total fertility rate in Pakistan is 3.6%, while the wanted fertility rate is 2.9%. This indicates that the observed fertility rate is 0.7 percentage points higher than the desired fertility rate.

Figure 7.4: Fertility rate for Pakistan, South Asia, and World from 1971 to 2021



Source: Data from World Bank (2023).

Figure 7.5: Fertility rate in the South Asian Countries from 1971 to 2021



Source: Data from World Bank (2023).

Greenhouse Gas Emissions

Greenhouse gas emissions (GHG) in Pakistan have been increasing over time. Although Pakistan is one of the lowest emitters of GHGs globally as of 2022, its emissions have been risen significantly. In Appendix A, Figure A1 shows that in 1971, Pakistan's GHG emissions were 105 megatonnes, which increased to 546 megatonnes per year in 2022. Figure A2 presents per capita GHG emissions. Figure A3 compares per capita GHG emissions among South Asian countries, while Figure A4 shows per capita GHG emissions in top emitting countries. Figure A5 displays total GHG emissions in top emitting countries.

Coastal Erosion

Pakistan is endowed with very rich coastal resources that provide valuable ecosystem services, including provisioning, supporting, regulating, and cultural services. However, these coastal resources are under threat due to both climate change and population growth. Climate change poses serious threats to these resources, not only through sea level rise but also through changing rainfall patterns and erratic water flow from the Indus River into the sea. Furthermore, due to population growth, water demand from agriculture, industries, and households has been increasing, resulting in more irregular water flow into the sea. Consequently, Pakistan's coastal resources have been degrading over time.

Figure 7.6 presents the pattern of sea level rise along the Karachi coast as reported by PSMSL (2020), along with a fitted exponential trend. The data show that the sea level rose from 7029 to 7238 mm from 1916 to 2016, indicating an increase of 209 mm (or 20.9 cm) over the past 100 years. This represents an average rise in sea level has been 2.09 mm per year. The figure also indicates that sea level has been more pronounced in recent years compared to the past century. According to the IPCC fourth assessment report (2007), as cited in Rasul et al. (2012), sea levels during the 20th century rose about 150–200 mm (1.5 to 2.0 mm per year), with the rate at the end

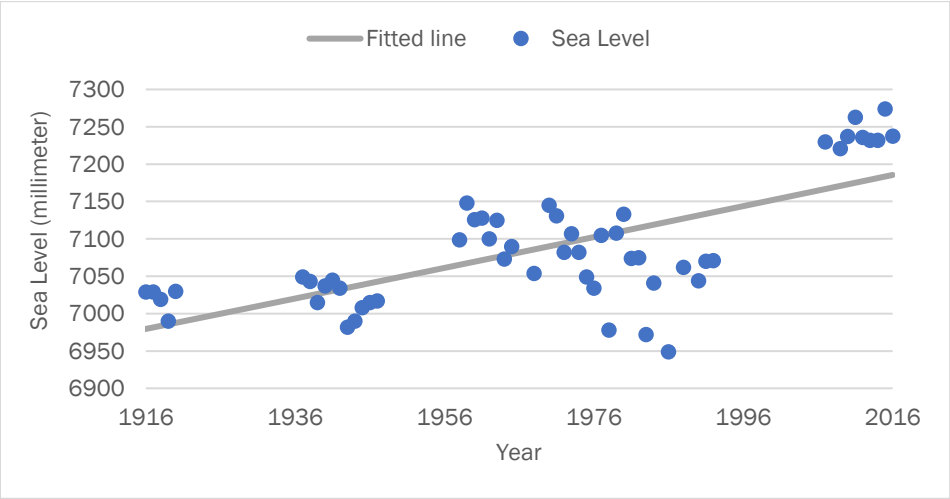
of the century increasing to about 3.1 mm per year, significantly higher than the average rate for the 20th century.

The coastline of Pakistan includes two parts: the Sindh coast and the Makran coast. The Indus Delta, which makes up about 85% of the Sindh coastal belt, is one of the most important ecosystems in Pakistan (MFF Pakistan, 2016). Figure 7.7 shows that the area under water and the salt-affected area in the Indus Delta has increased from 1972 to 2018 due to sea intrusion. During this period, the area under water increased by 97 thousand hectares, while the salt-affected area expanded by 135 thousand hectares. As a result, the area under vegetation and other uses has thus decreased, as shown in Figure 7.8. Furthermore, the area under mangroves has also declined, as shown in Figure 7.9.

Sánchez-Triana et al. (2015) estimated that 39% of agricultural land has been severely affected by seawater intrusion, with an additional 11% of cultivated land partially affected and at risk of further degradation in Sindh. Mahar and Zaighiam (2019) conducted an analysis using satellite data and found that the cultivated area in the Indus delta has declined over time. Specifically, they found that the cultivated area decreased from 47,320 hectares in 1998 to 19,744 hectares in 2018, a decline of 58% over two decades. This situation has adversely affected local livelihoods, as the region has experienced a drop in agricultural productivity and a decline in fish catches, ultimately leading to forced migration for survival.

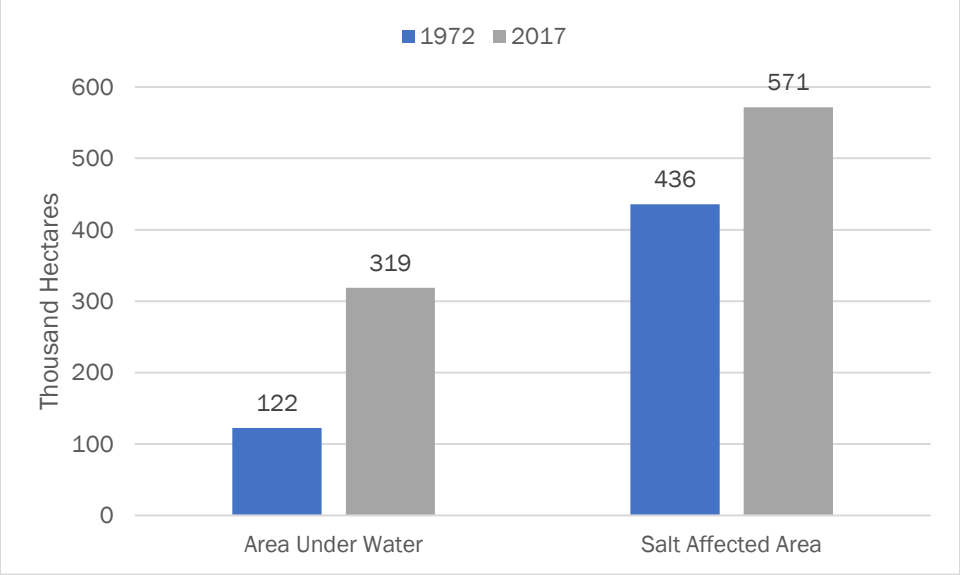
As discussed above, coastal resources in Pakistan have been significantly impacted by both climate change and population growth. The coastal areas are experiencing sea intrusion, which is attributed to sea level rise and irregular water flow from the Indus River into the sea. Figure 7.10 shows the number of days (out of approximately 182 days) with zero water flow below the Kotri Barrage during the Kharif (Apr–Sep) and Rabi (Oct–March) seasons, highlighting the frequent and increasing occurrence of zero water flow since 2001. Figure 7.11 illustrates the number of days with zero water flow below the Kotri Barrage in a year (sum of Kharif and Rabi), showing an upward trend over time. Maintaining a continuous flow downstream of the Kotri Barrage is critical for sustaining the ecosystems of the Indus Delta (Young et al., 2019). Figures 7.10 and 7.11 clearly show a lack of continuous flow and extremely low flow over consecutive years, which can be attributed to both climate change and growing water demand from agriculture, industries, and households due to population growth.

Figure 7.6: Annual average sea level at Karachi during 1916–2018



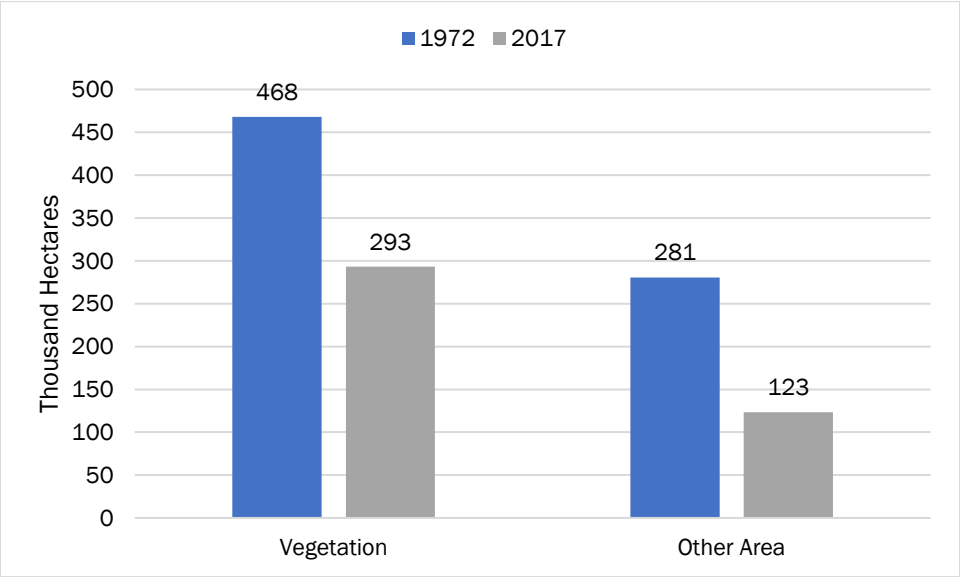
Source: PSMSL (2020).

Figure 7.7: Increase in area under water and salt-affected area in Indus Delta



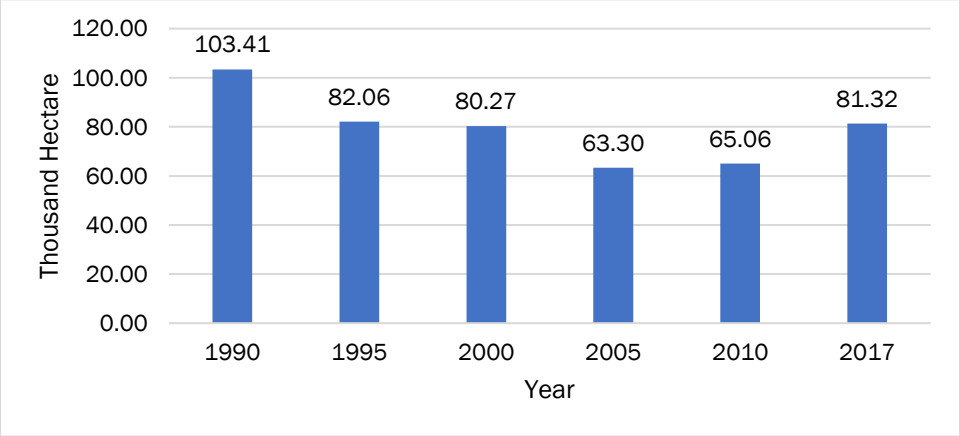
Source: Data from Siyal (2018).

Figure 7.8: Decrease in vegetation and other areas in Indus Delta



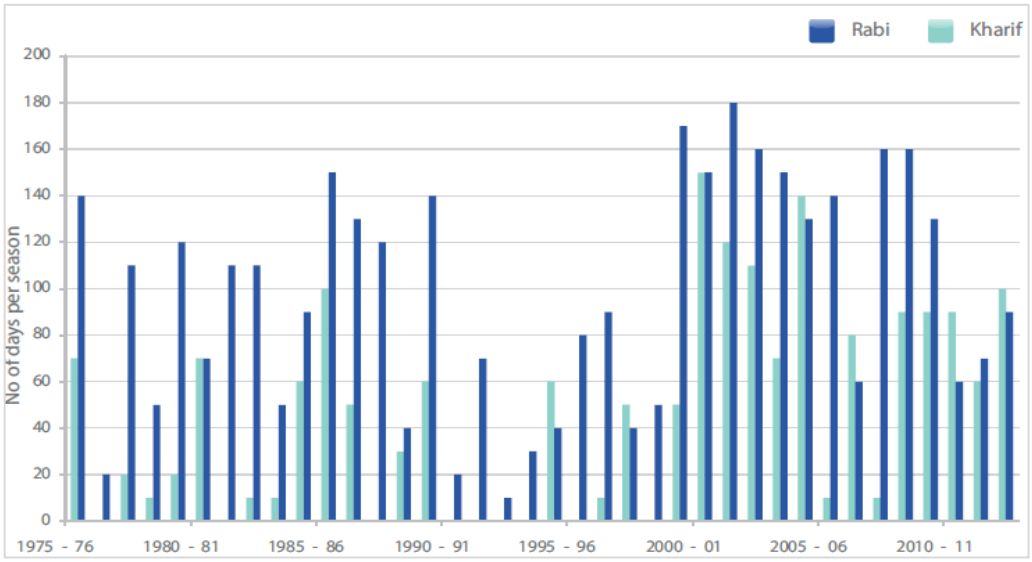
Source: Data from Siyal (2018).

Figure 7.9: Decrease in mangroves area in Indus Delta



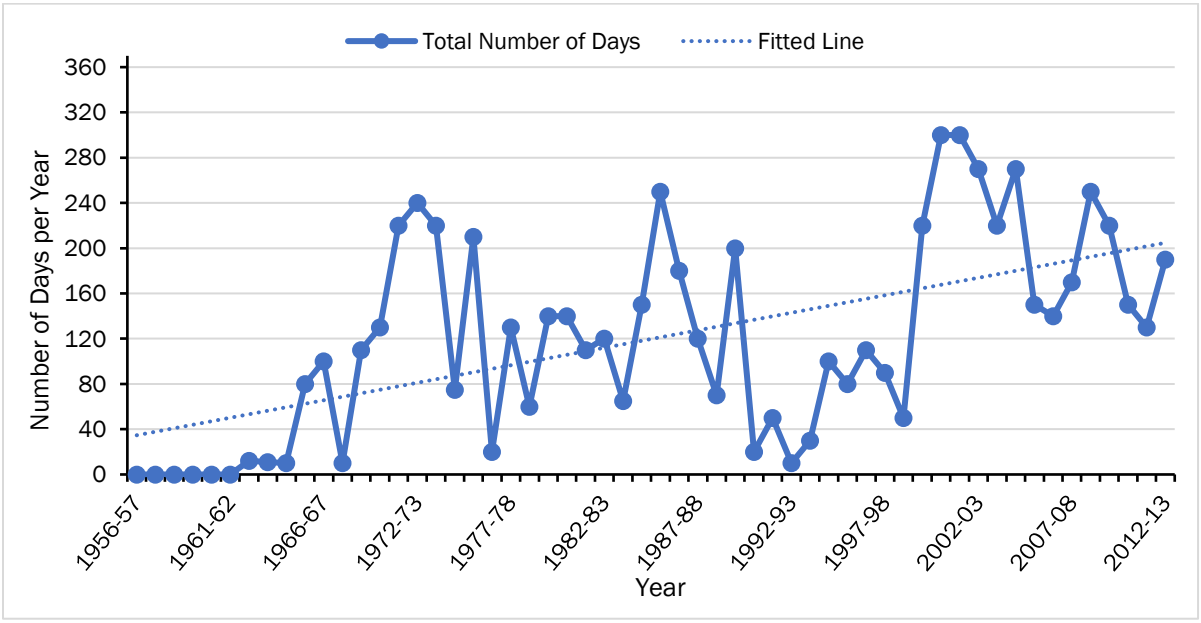
Source: Data from Siyal (2018).

Figure 7.10: Number of days with zero water flow below Kotri Barrage in Kharif and Rabi Seasons



Source: Indus River System Authority (IRSA) as cited in UNDP (2016).

Figure 7.11: Number of days with zero water flow below Kotri Barrage in a Year



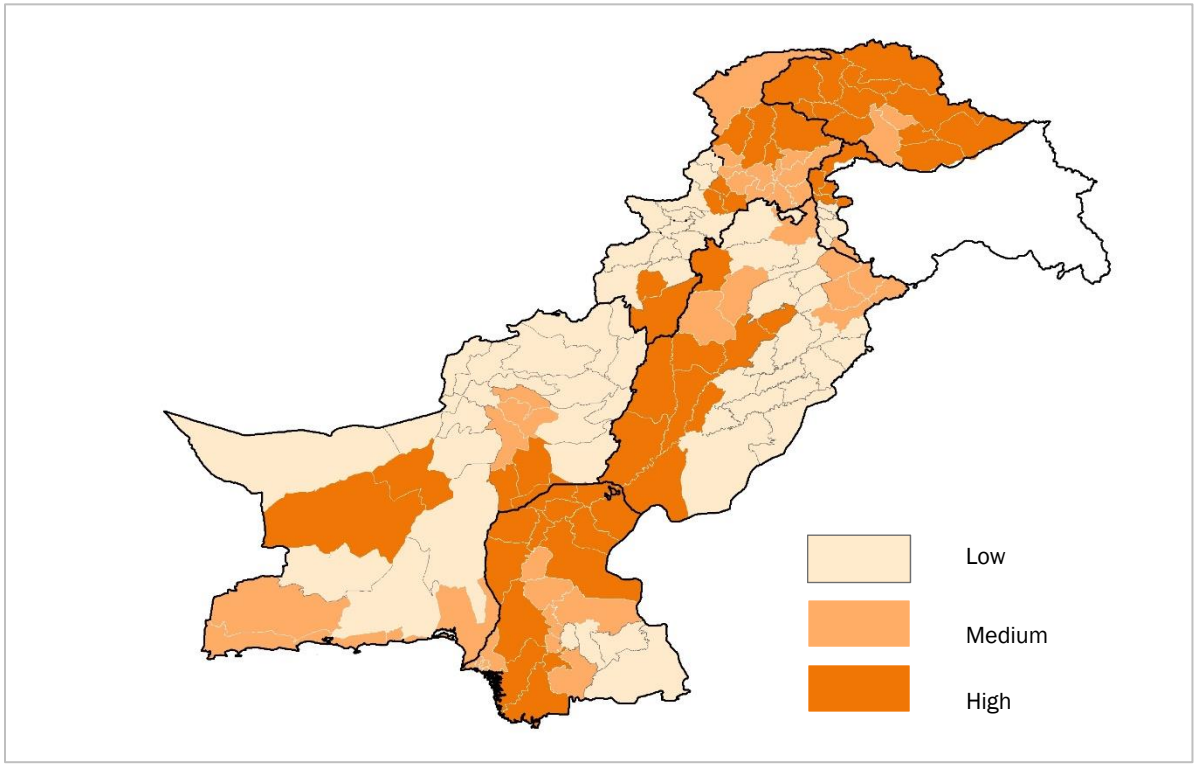
Source: Siyal (2018).

Climate Change and Population: Household Level Data Analysis

Climate Hazard Indices across Districts of Pakistan

Data on climate hazard indices are collected from Integrated Context Analysis (Government of Pakistan, 2017). Flood hazard index data has been computed using data on the number of recorded flood events from 1950 to 2015 and their severity. The dataset combined these two parameters and classified the districts on a three-point scale of hazard levels from 1 to 3, denoting low, medium, and high, respectively. Drought hazard index data has been computed using data on soil moisture and precipitation from 1951 to 2010. The dataset combined these two parameters and classified the districts on a three-point scale of hazard levels from 1 to 3, denoting low, medium, and high, respectively. Figure 7.12 presents the map showing flood hazard index, showing the level of flood risk faced by different districts across Pakistan. Figure 7.13 presents the map showing drought hazard index, showing the level of drought risk faced by different districts across Pakistan.

Figure 7.12: Flood hazard index across districts of Pakistan

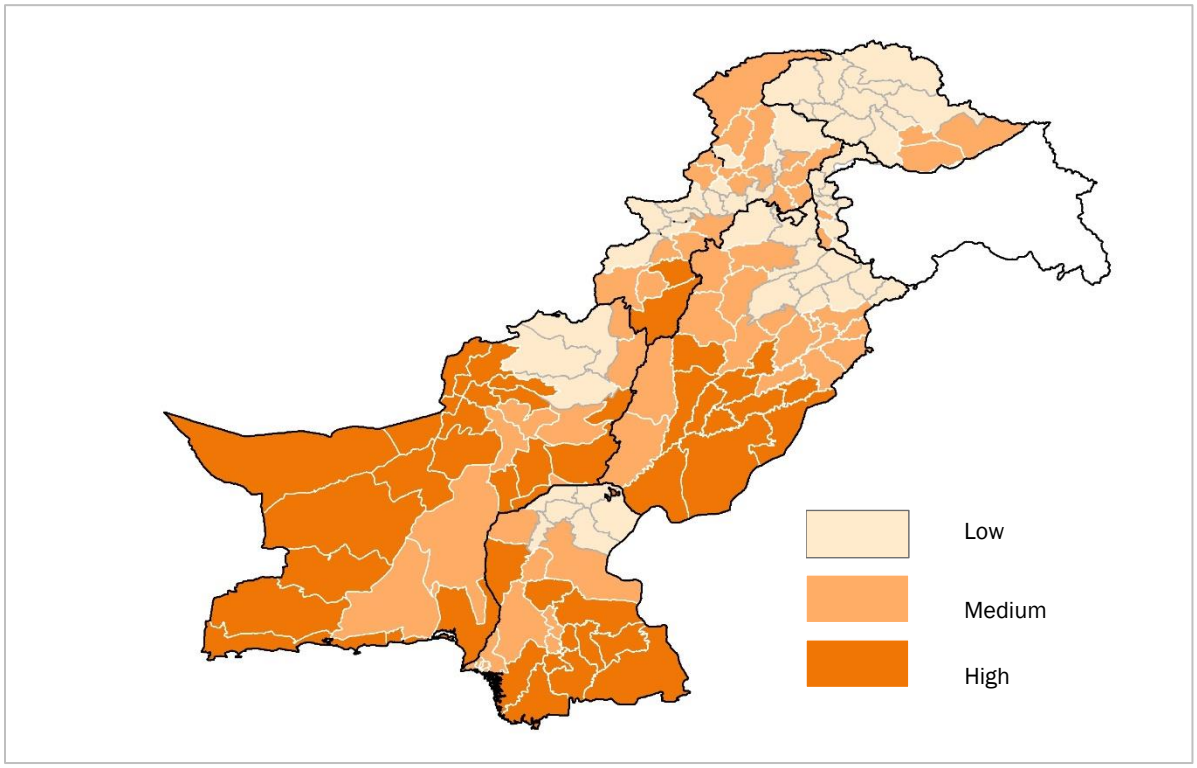


Source: Integrated Context Analysis (Government of Pakistan, 2017).

The flood hazard map in Figure 7.12 categorizes districts into low, medium, and high flood hazard zones. The flood-prone areas, particularly those along the Indus River in Khyber Pakhtunkhwa (KP), Punjab, and Sindh provinces, are depicted in dark orange, indicating a high flood hazard. These regions are densely populated due to their fertile agricultural land, which supports a significant portion of Pakistan's agrarian economy. However, frequent flooding in these areas has severe consequences: economically, floods can cause extensive damage to crops, infrastructure, homes,

and businesses, leading to substantial losses. The agricultural sector is particularly vulnerable, with crops being destroyed and soil fertility adversely affected. Health risks are also a major concern, as floods increase the risk of waterborne diseases like cholera, typhoid, and hepatitis due to contaminated water supplies. The inundation of water creates breeding grounds for mosquitoes, raising the incidence of vector-borne diseases such as malaria and dengue fever. Additionally, flooding often leads to the displacement of large communities, disrupting social networks and livelihoods. Displaced populations face challenges in terms of shelter, access to clean water, sanitation, and healthcare, exacerbating their vulnerability. Critical infrastructure, including roads, bridges, schools, and hospitals, can be severely damaged, hampering rescue and relief operations as well as long-term development efforts. In conclusion, the flood hazard map highlights the varied risks across different regions of Pakistan, emphasizing the need for tailored flood management and mitigation strategies to address the unique geographical and socio-economic challenges, particularly in areas like Punjab, Sindh, and KP, to enhance resilience against flooding.

Figure 7.13: Drought hazard index across districts of Pakistan



Source: Integrated Context Analysis (Government of Pakistan, 2017).

The drought hazard map in Figure 7.13 highlights districts with varying levels of drought hazard, categorized into low, medium, and high zones. High drought hazard areas are depicted in dark orange, primarily located in Balochistan and parts of Sindh and Punjab. These regions, while less densely populated than flood-prone areas, still face significant challenges due to their dependence on agriculture and livestock farming. Drought severely impacts agricultural productivity by causing crop failures and reducing soil moisture levels, leading to lower crop yields and a loss of income for

farming communities. The livestock sector also suffers as water and fodder become scarce. Drought exacerbates water scarcity issues, affecting drinking water supplies and irrigation systems, which can lead to conflicts over water resources and force communities to migrate in search of better living conditions. The economic impact of drought extends beyond agriculture; reduced agricultural output can lead to higher food prices, affecting food security. The cost of importing food and providing relief to affected populations places additional strain on the national economy. Prolonged droughts can lead to malnutrition, particularly among children, as food supplies dwindle. Access to clean water is compromised, increasing the risk of waterborne diseases. The stress associated with drought can also lead to mental health issues within affected communities.

Table 7.3 presents the population density and population growth rate across districts categorized by different levels of climate hazard risks: low, medium, and high. The statistics indicate that districts with a high level of flood risk exhibit a lower population growth rate compared to districts with medium or low risk. Similarly, districts with a high level of drought risk also show a lower population growth rate than those at lower risk levels. These findings suggest a trend of net out-migration from districts facing high flood and drought risks.

Table 7.3: Climate hazard Indices, density, and population growth rate

Index	Number of districts	Population density (persons per sq. km)	Population growth rate (percent)
Flood Hazard Index			
Low	64	269	2.69
Medium	35	403	2.57
High	37	296	2.26
Drought Hazard Index			
Low	40	605	2.56
Medium	52	349	2.68
High	44	175	2.35

Source: Author's computation using data from Integrated Context Analysis (Government of Pakistan, 2017) and Population and Housing Census (Government of Pakistan, 2024).

Climate Change, Child Dependency Ratio, and Income of Agriculture Households

For the household-level analysis, we collected data from the Pakistan Social and Living Standards Measurement survey for the year 2019–2020, encompassing 126 districts of Pakistan (Government of Pakistan, 2020). We extracted data from 44,823 households engaged in the agriculture sector, where at least one household member earns income from this sector. Climate data on flood hazard index and drought hazard index were sourced from the Integrated Context Analysis (Government of Pakistan, 2017), while climate data on temperature and precipitation for the past 30 years (1990–2019) across the 126 districts were obtained from Google Earth Engine (2024). Climate variables for temperature and precipitation were computed by determining their average value and standard deviation over the 30-year period.

Table 7.4 presents descriptive statistics for each variable used in the regression model, while Table 5 displays the regression results. The dependent variable is the natural logarithm of the total income of households engaged in the agriculture sector. Among the explanatory variables, climate variables include flood hazard index, drought hazard index, average precipitation, average precipitation squared, standard deviation of precipitation, average temperature, average temperature squared, and standard deviation of temperature. Control variables encompass the average education level of earning members, the number of earning members, the market value of assets, and the child dependency ratio.

The results in Table 7.4 reveal that the average household annual income is PKR 0.362 million, with a notable standard deviation, indicating income inequality among households. Earning members of households have an average education level of 3.5 years, while the average number of earning members in a household is 1.5. The average market value of household assets is PKR 4.553 million. The average child dependency ratio is 0.86, ranging from 0 to 9.

Table 7.5 presents regression results for two models: model 1 is based on flood hazard index and drought hazard index, while model 2 is based on the average value and standard deviation of precipitation. Results from model 1 indicate that households facing a one-unit higher flood index experience a 2.04% lower income, and similarly, households facing a one-unit higher drought index earn a 3.06% lower income. The results of this model also show a quadratic relationship between household income and temperature, indicating an initial rise in income with temperature, followed by a peak and subsequent decline. The marginal effect at the average value is computed and reported in the table. On average, a one-degree Celsius increase in average temperature results in a 1.47% decrease in income. A one-year increase in the education level of earning household members results in a 3.61% increase in household income, on average. An increase of one person in the number of earning members boosts household income by 32.5%, on average. Wealthier households with an additional asset value of one million PKR have a 2.32% higher income. Lastly, households with a one-unit higher child dependency ratio experience an 8.84% lower income, suggesting that higher child dependency ratios lead to higher expenditure on consumption goods and lower investment, resulting in reduced income levels.

Table 7.4: Descriptive statistics of households from agriculture sector

Variables	Mean	SD	Min	Max
Annual Income (PKR million)	0.362	0.646	0.00150	41.80
Flood index	1.900	0.871	1	3
Drought index	2.166	0.798	1	3
Precipitation (cm)	32.64	26.45	7.896	134.6
SD of Precipitation (cm)	8.314	4.240	2.188	27.27
Temperature (°C)	23.70	5.239	-3.161	28.30
SD of Temperature (°C)	0.584	0.138	0.280	0.987
Average education of earning members (years)	3.462	4.257	0	18
Earning members (number)	1.497	0.824	1	9
Assets (PKR million)	4.553	10.66	0	290.4
Child dependency ratio	0.862	0.849	0	9
Observations	44,823			

Source: Author's computations using data from PSLM 2019–2020 (Government of Pakistan, 2020), Integrated Context Analysis (Government of Pakistan, 2017), and Google Earth Engine (2024).

Table 7.5: Regression results for annual income of households from agriculture sector

	Model 1	Model 2
Variables	**ln(income)**	**ln(income)**
Flood hazard index	-0.0204***	
	(0.00466)	
Drought hazard index	-0.0306***	
	(0.00519)	
Precipitation (cm)		0.00888***
		(0.000875)
Precipitation squared		-0.00006***
		(0.000005)
SD of Precipitation		-0.0331***
		(0.00213)
Temperature (°C)	0.0449***	0.0780***
	(0.00336)	(0.00339)
Temperature squared	-0.00126***	-0.00249***
	(0.000103)	(0.000108)
SD of Temperature	0.469***	0.0789
	(0.0389)	(0.0483)
Average education of earning members (years)	0.0361***	0.0383***
	(0.000924)	(0.000922)
Earning members (number)	0.325***	0.327***
	(0.00465)	(0.00460)
Assets (PKR million)	0.0232***	0.0230***
	(0.000368)	(0.000366)
Child dependency ratio	-0.0884***	-0.0881***
	(0.00453)	(0.00449)
Constant	-2.594***	-2.445***
	(0.0417)	(0.0384)
Marginal effect of precipitation		0.00482
Marginal effect of temperature	-0.01473	-0.03986
Observations	44,583	44,823
R-squared	0.258	0.266
F-statistics	1720.48	1622.96
P-value	0.0000	0.0000

Note: Standard errors are given in parentheses. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

Source: Author's computations using data from PSLM 2019–2020 (Government of Pakistan, 2020), Integrated Context Analysis (Government of Pakistan, 2017), and Google Earth Engine (2024).

Results from model 2 reveal a quadratic relationship between household income and precipitation, indicating an initial rise in income with precipitation, followed by a peak and subsequent decline. Similar nonlinear patterns are observed for temperature. Marginal effects at the average are computed for these cases, as reported in the table. On average, a one-degree Celsius increase in average temperature results in an almost 4% decrease in income, while a one-centimeter increase in average precipitation is associated with a 0.48% increase in income.

The household analysis for the agriculture sector reveals significant negative impacts of climate change on agricultural productivity and livelihoods. These findings have critical implications for urban areas as well. Reduced agricultural yields can lead to increased food prices and food insecurity, which disproportionately affect urban populations, especially the poor. Additionally, diminished rural livelihoods may drive rural-to-urban migration, intensifying the strain on urban infrastructure,

Climate Change and Out-Migration

To evaluate the impact of climate variables on migration, we use migration data from Pakistan Demographic and Health Survey 2017–2018 (Pakistan DHS, 2019). The sample includes 11,869 households from Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Islamabad Capital Territory, and FATA, excluding Azad Jammu and Kashmir and Gilgit Baltistan, as done in Pakistan DHS report. We use household-level data for the analysis. For out-migration, households were asked to report whether there were any members of the household who lived together in the past 10 years but have since moved away. The household also reported the reasons for out-migration. In our analysis, we considered out-migration for all reasons except marriage. These reasons include better economic opportunities, accompanying family, studies, transfer of jobs, natural disasters, and other reasons.

Climate data on flood hazard index and drought hazard index were sourced from the Integrated Context Analysis (Government of Pakistan, 2017), while climate data on temperature and precipitation for the past 30 years (1990–2019) across 126 districts were obtained from Google Earth Engine (2024). Climate variables for temperature and precipitation were computed by determining their average value and standard deviation over the 30-year period.

Table 7.6 presents descriptive statistics for each variable used in the regression model, while Table 7.7 displays the regression results. The dependent variable is a binary variable for out-migration, which equals 1 if any member of the household had out-migrated, as defined above. Among the explanatory variables, climate variables include flood hazard index, drought hazard index, average temperature, average temperature squared, average precipitation, average precipitation squared, standard deviation of temperature, and standard deviation of precipitation.

Results in Table 7.6 reveal that 13.6% of the sampled households reported out-migration of a household member during last ten years. Table 7.7 presents regression results for two models: model 1 is based on the flood hazard index and drought hazard index, while model 2 is based on the average value and standard deviation of precipitation. Results from model 1 indicate that household members from districts with a one-unit higher index of flood hazard index have a 1.2 percentage point higher probability of out-migration. Similarly, household members from districts with a one-unit higher index of drought hazard have a 0.9 percentage point higher probability of out-migration. The

results of this model reveal a quadratic relationship between out-migration and temperature. As temperatures rise, the out-migration rate initially declines, reaching a minimum point, and then begins to increase. This pattern indicates that districts with both very low and very high temperatures experience higher out-migration rates compared to those with moderate temperatures. The findings suggest that extreme temperatures, whether too cold or too hot, create unfavorable living conditions, potentially driving people to migrate in search of more suitable place for work or study. Results from model 2 also demonstrate a quadratic relationship between out-migration and temperature as well as between out-migration and precipitation. Out-migration of a household member appears to be a part of the adaption strategy, as they send home remittances (Arif, 2024).

Table 7.6: Descriptive statistics of households

Variables	Mean	SD	Min	Max
Out-migrated (1=yes, 0=no)	0.136	0.343	0	1
Flood index	1.801	0.818	1	3
Drought index	1.882	0.773	1	3
Precipitation (cm)	46.43	36.92	7.896	134.6
SD of Precipitation (cm)	10.76	5.309	2.188	27.27
Temperature (°C)	22.81	4.751	-3.161	28.30
SD of Temperature	0.604	0.180	0.280	0.987
Observations	11,869			

Source: Author's computations using data from Pakistan DHS (2019), Integrated Context Analysis (Government of Pakistan, 2017), and Google Earth Engine (2024).

Table 7.7: Regression results for out-migration in households

	Model 1	Model 2
Variables	out-migrated (1=yes, 0=no)	out-migrated (1=yes, 0=no)
Flood index	0.0121***	
	(0.00403)	
Drought index	0.00931**	
	(0.00452)	
Precipitation (cm)		0.00750***
		(0.000626)
Precipitation squared		-0.00003***
		(0.000003)
SD of Precipitation (cm)		-0.0153***
		(0.00182)
Temperature (°C)	-0.0102***	-0.0171***
	(0.00235)	(0.00254)
Temperature squared	0.000206***	0.000557***
	(0.00007)	(0.00008)
SD of Temperature (°C)	0.195***	-0.00901
	(0.0244)	(0.0307)
Chi-squared statistics	187.63	336.08
P-value	0.0000	0.0000
Observations	11,037	11,037

Note: Standard errors are given in parentheses. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

Source: Author's computations using data from Pakistan DHS (2019), Integrated Context Analysis (Government of Pakistan, 2017), and Google Earth Engine (2024)

Conclusions and the Way Forward

Based on the descriptive statistics, trend analysis, household level data analysis, and evidence from the literature review, this section outlines the implications of the linkages between climate change and population dynamics in the context of Pakistan.

Pakistan stands as the fifth most populous country globally, with a population of 241.5 million in 2023. The country's fertility rate, at 3.6, exceeds the South Asian regional and global averages of 2.24 and 2.27, respectively. The Pakistan Demographic Health Survey (PDHS) 2017–2018 indicates a wanted fertility rate of 2.9, signaling the need for family planning programs and the potential for voluntary reduction of fertility rates at the household level.

Pakistan faces some of the world's highest natural disaster risks, grappling with the impacts of extreme weather events, and ranks eighth among the most affected countries from 2000 to 2019. Climate change and population growth further endanger Pakistan's natural resources, necessitating urgent action through integrated approaches that address climate change, environmental concerns, and population growth.

Household level data analysis shows that flood hazards, drought hazards, and overall climate change negatively affect the income of households in the agricultural sector. Furthermore, households with one-unit higher child dependency ratio have almost 9% lower income. This indicates that the households with a higher child dependency ratio spend more of their budget on consumption goods and less on investment goods, leading to lower income levels. Mukhtar (2024) also shows similar findings in chapter 4 of this volume. Additionally, the analysis shows that flood hazards, drought hazards, and overall climate change lead to higher out-migration rates in Pakistan.

The household level analysis underscores the importance of making full efforts for achieving the demographic targets set by the CCI, particularly to improve CPR and reduce fertility. Evidence-based analysis in the literature shows that reducing fertility rates is a cost-effective strategy to address the climate change challenges (Speidel et al., 2015; Wheeler and Hammer, 2010). Starbird et al. (2016) argue that a high fertility rate exposes more people to climate risks and aggravates the negative impacts of climate change. Thus, along with climate adaptation measures, reduction in fertility rate should be an integral part of strategies to mitigate the negative climate change and achieve climate-resilient development in Pakistan. Furthermore, reducing population growth would also support emissions reduction. Mansoor and Sultana (2018) empirically estimated the elasticity of the impact of population on emissions in Pakistan as 0.24, indicating that 1% decrease in population would lead to 0.24% decrease in emissions. Although Pakistan is one of the lowest emitters of GHG globally, considering the increasing trend of emissions, Pakistan can contribute to emission reduction by reducing fertility rates. Additionally, family planning services can also support Nationally Determined Contributions (NDCs) submitted by Pakistan and other countries in line with commitments made in the 2015 Paris Agreement (UNFCCC, 2020).

Pakistan needs to adopt an integrated approach that jointly considers climate change, environment concerns, natural resources, and population dynamics. Given the uncertainty of future climate conditions and projections indicating that average temperatures will exceed 1.5 degrees Celsius in

all but the low emission scenario, it is crucial for Pakistan to consider the interplay between climate change with population dynamics. Reducing fertility rates can play a significant role in climate mitigation and adaptation over the next 25 years. If current fertility rates persist, the rapidly growing population will exacerbate the adverse impacts of climate events, leading to increased food and water scarcity, heightened health risks, and more frequent displacement. By 2030, this could result in a significant portion of the population being affected by climate events, with the situation worsening by 2050. In contrast, a rapid decline in fertility rates would lead to more manageable population growth, thereby reducing the strain on resources and enhancing overall community resilience to climate impacts.

Incorporating Shared Socioeconomic Pathways (SSPs) into policy planning can provide a roadmap for understanding the future implications of fertility reduction on climate adaptation and mitigation. Under SSP1, which emphasizes sustainability and lower emissions, a reduction in fertility rates could significantly improve adaptive capacity, reduce greenhouse gas emissions, and facilitate sustainable development. This would result in fewer people exposed to climate-related risks by 2030 and an overall enhancement in community resilience by 2050. Consequently, integrating fertility reduction strategies into climate policies is not only beneficial for managing population growth but also essential for building a robust framework for climate resilience, ensuring that Pakistan can better cope with the impending challenges of climate change.

Looking ahead to the future of Pakistan in 2050, it is imperative for policymakers to take proactive measures to address the challenges posed by climate change and population dynamics. Investing in sustainable development strategies, including education, healthcare, and environmental conservation, will be crucial for ensuring the wellbeing and resilience of Pakistan's population in the face of evolving climate conditions and demographic trends. By adopting forward-thinking policies and fostering international cooperation, Pakistan can position itself to thrive in a rapidly changing global landscape.

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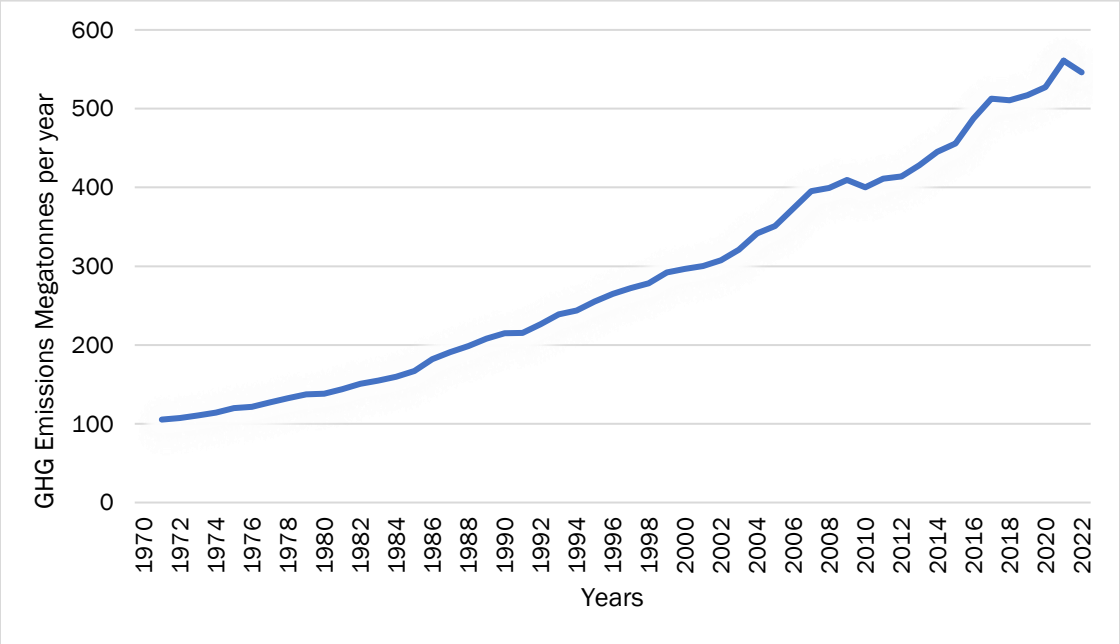
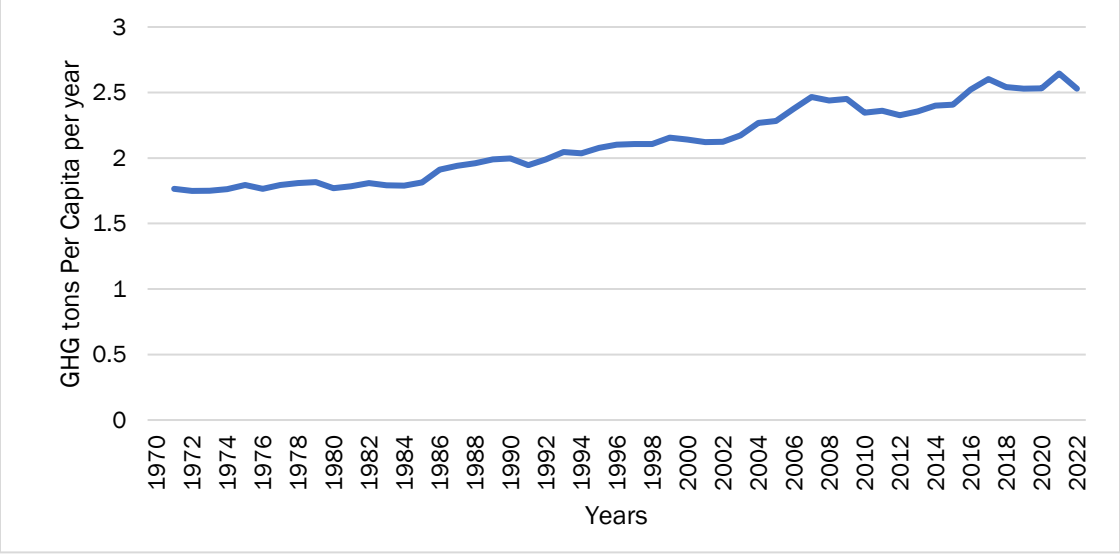
Appendix A

Figure A1: Greenhouse gas emissions from 1971 to 2022 in Pakistan



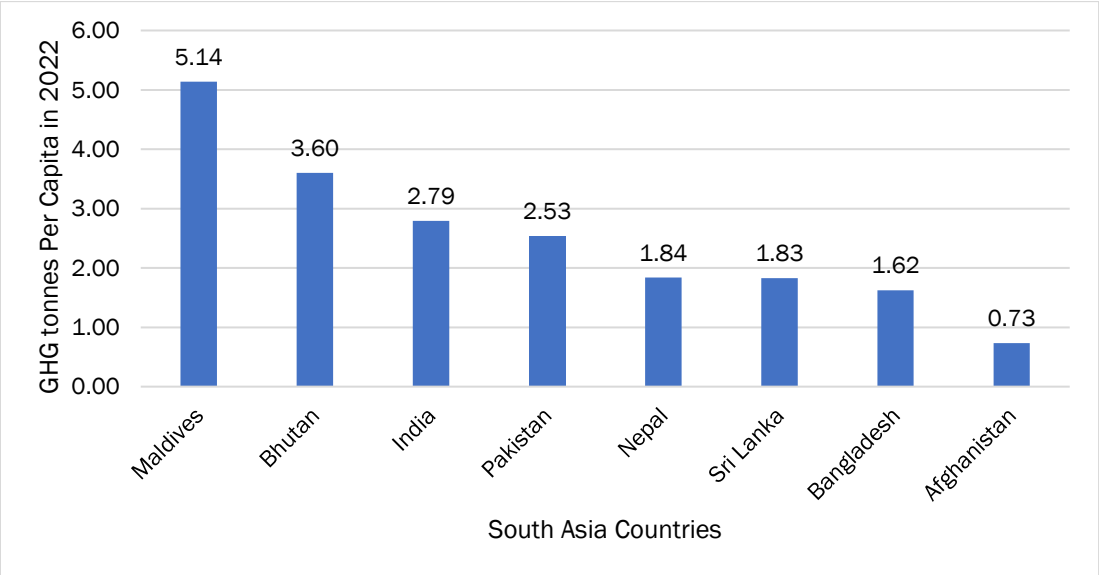
Source: Data from EDGAR (2023).

Figure A2: Per capita greenhouse gas emissions from 1971 to 2022 for Pakistan



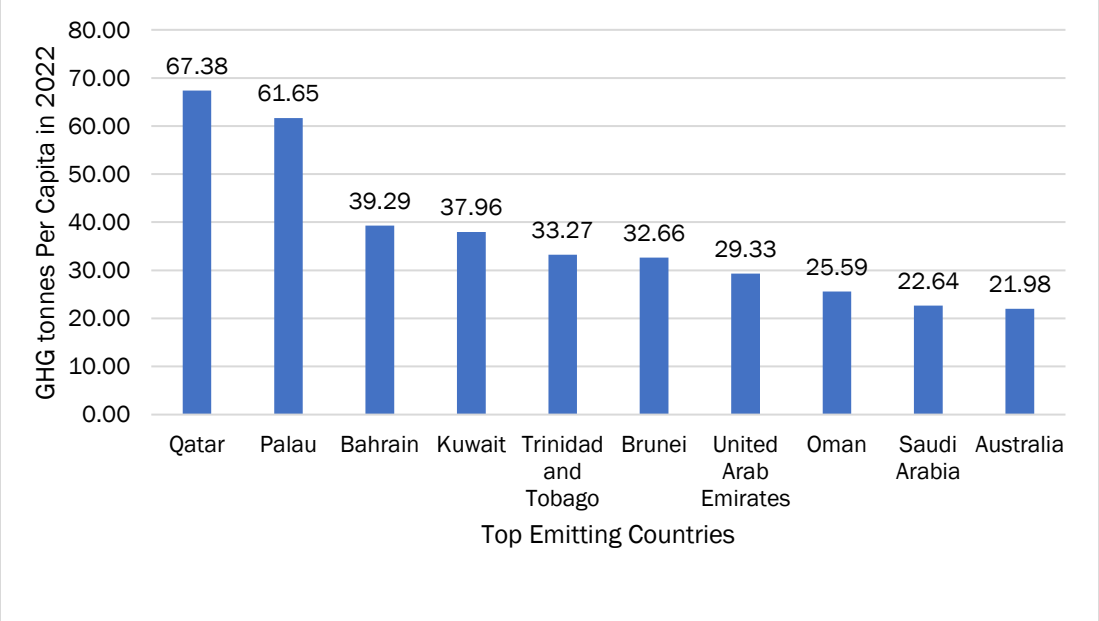
Source: Data from EDGAR (2023).

Figure A3: Greenhouse gas emissions per capita in South Asian countries in 2022



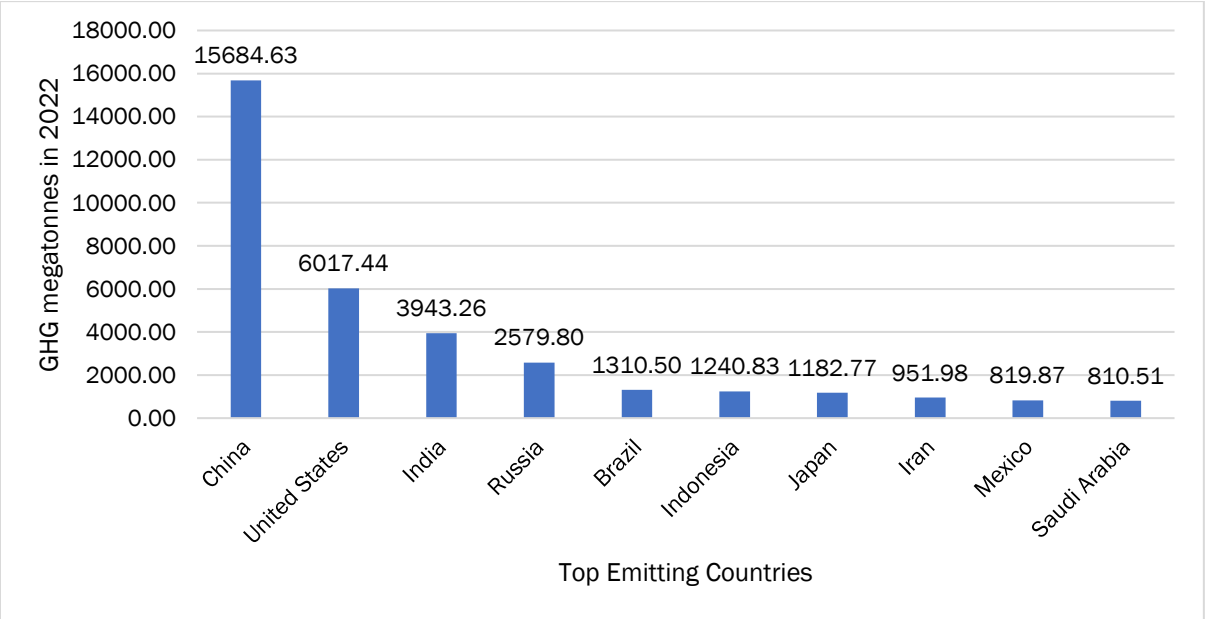
Source: Data from EDGAR (2023).

Figure A4: Greenhouse gas emissions per capita in top emitting countries in 2022



Source: Data from EDGAR (2023).

Figure A5: Total greenhouse gas emissions in top emitting countries in 2022



Source: Data from EDGAR (2023).

CHAPTER 8

Conclusions and Policy Recommendations

G.M. Arif

This volume aims to illustrate Pakistan's projected demographic state in 2050, based on factors such as population growth rates, the rural-urban divide, provincial and regional distribution, and shifts in age structure. The projection model incorporates Pakistan's demographic targets, set by the Council of Common Interests (CCI), along with government-led educational initiatives. In addition to assessing the economic costs of past high population growth, this volume demonstrates how a rapid decline in population growth rates could enhance savings, investment, and GDP growth by 2050—key elements for realizing the demographic dividend.

Migration and urbanization are examined within the framework of structural transformation, which involves the movement of population and labor from agriculture to urban manufacturing and services, as well as demographic transition and urban governance. The current stall in fertility rates is also discussed in relation to structural changes and human capital development. Finally, the volume explores how climate change indicators—floods, droughts and temperature changes—affect agricultural income at the household level and drive out-migration.

The analyses in this volume draw on various data sources including population censuses, Pakistan Demographic and Health Surveys, Pakistan Social and Living Standards Measurement Surveys, Household Integrated Economic Surveys, Labour Force Surveys, national accounts (such as saving-investment rates and GDP growth), and climate indicators. The authors employ rigorous methodologies, including population projection models, simulation, and regression techniques. Each chapter summarizes findings and policy implications, while this chapter synthesizes the major conclusions, key challenges, and policy options from the entire volume.

Conclusions

Population Dynamics

An analysis of population dynamics reveals limited improvement in demographic indicators impacting population growth rates. Following a delayed demographic transition, fertility rates have recently stalled, contraceptive prevalence rates (CPR) remain stagnant, and the desire for children is high (Chapter 2). Consequently, the annual population growth rate decreased only marginally, from 3.7% in 1972 to 2.55% in 2023—quadrupling Pakistan's to 242 million. The most recent intercensal period (2017–2023) even saw an increase in growth rates across all provinces and regions.

Fertility Transition Challenges

Ironically, key factors enabling fertility transition—female education, infant and child mortality, and female labor force participation—show poor progress (Chapters 3 and 6). The negative association between the standard of living (per capita income growth) and fertility transition through the quantity versus quality phenomenon is well established (Chapters 4 and 6). Poverty rates remain high, and Pakistan's living standard has not improved (Chapters 2 and 4). These factors continue to drive high population growth rates.

Age Structure and Dependency Ratio

A positive demographic development is a gradual shift in the population's age structure, though linked to a slow fertility transition. The share of the working-age population has increased, and the dependency ratio has declined. However, this change is much slower than in neighboring countries and in Southeast and East Asia. The dependency ratio affects national income, as in the short run, it causes a rapid increase in consumption. The country's ability to save is reduced, as more children lead families to allocate part of their savings toward increased consumption. Lower savings, along with potential diversion of investment toward consumption, results in slower capital accumulation, which negatively impacts the economy's savings potential (Chapter 4).

Labor Force Dynamics and Productivity

The analyses carried out in Chapters 2, 3, 4, and 6 show a complex situation concerning the size of labor force, labor productivity, and female labor force participation. On the one hand, the rising share of working-age population contributed to increasing the size of the labor force, meaning adding more earning hands, which is beneficial for the concerned households as well as the economy of Pakistan. However, on the other hand, labor productivity, which is a necessary condition for high sustained economic growth, remains low because of low investments in human capital and the skills of youth or new entrants in the labor market. A key observation is that "the population is an economic resource only if every additional person added to the labor force produces more output than they consume, suggesting that average labor productivity should exceed average consumption for the population to be self-sustaining" (Chapter 4). To increase labor productivity, the country needs sufficient savings and investment rates so that enough capital and technology can be accumulated. Currently, however, the savings and investment rates are abysmally low.[34] Similarly, the benefits of demographic transition cannot be reaped with the low and stagnant participation of females in the labor market.

Urbanization and Structural Transformation

Urbanization, a key development indicator, contributes to rapid demographic transition. The level of urbanization in Pakistan is the highest in South Asia, contributed primarily by natural increase as well as rural-urban migration. The analysis carried out in Chapter 6 examines the migration and

[34] Further, the analysis of the economy and population carried out in Chapter 4 demonstrates that Pakistan is caught in a situation where high population growth leads to a high dependency ratio, which leads to low savings, which leads to low investment, which leads to low labor productivity, which leads to low economic growth, further lowering the savings rate and perpetuating high population growth. Until the 1990s, Pakistan avoided this vicious cycle from becoming explosive by mobilizing sizable and relatively inexpensive foreign resources. However, these resources have started to become increasingly limited and much more expensive, causing the vicious cycle to become even more pronounced.

urbanization phenomenon in the context of structural transformation.[35] The migration, urbanization, and structural transformation nexus only partially holds in Pakistan because the agriculture and manufacturing sectors have contributed little to labor mobility from the traditional, low-productivity sector of agriculture to manufacturing. However, the urban services sector, which is mostly informal, has absorbed the growing labor force, including rural-urban migrants. Furthermore, disguised unemployment in the agriculture sector remains high—compared to its 20% share in GDP, it provides employment to around 40% of the employed labor force.

Rural-to-urban migration, though modest, is not supported by rural development and increased productivity; rather demographic pressure, reinforced by high levels of rural poverty, has generated migratory flows. However, despite several challenges and issues such as the rapid growth of slums and low-quality housing, urbanization has shown strength through the growth of the services sector contributing to GDP growth and providing employment opportunities for the growing labor force. Cities and towns offer better opportunities for quality of life.

Overseas Migration and Remittances

Temporary overseas migration to the Middle East has helped absorb the growing labor force, with foreign remittances boosting household incomes. The return of skilled emigrant workers represents a "brain gain," for the country, mitigating concerns of large-scale "brain drain" from Pakistan.

Fertility Transition and Structural Transformation

The fertility transition in Pakistan has been characterized as delayed, slow, and more recently, stalled. Contrary to traditional theories which hypothesize that a shift from agriculture to non-agriculture disrupts traditional family structures, thereby increasing the opportunity costs of not working for women and decreasing the gains from child labor, the analysis in Chapter 6 shows a weak association between structural transformation (shifting from agriculture to non-agriculture) and fertility decline. This association, therefore, may not be a sufficient condition in the absence of other factors. Female education remains a major factor for fertility transition (Chapters 2, 3, and 6).

Long-term Prospects for Structural Change

Significant improvements in the structural transformation of the society and the economy—such as higher agricultural productivity, urban manufacturing growth, and fertility decline—are unlikely in the short term (in the next decade). However, by 2050, the outlook is promising, with urban areas potentially achieving replacement-level fertility.

Climate Change and Population Dynamics

Chapter 7 links climate change with population dynamics by developing a "flood hazard index" and a "drought hazard index." Three major conclusions drawn from this analysis are: First, the flood-prone areas along the Indus River across Khyber Pakhtunkhwa, Punjab, and Sindh provinces are densely populated, have fertile agricultural land, and produce a significant portion of major and minor crops.

[35] The structural transformation of a society and economy refers to five integrated factors: 1) a declining share of agriculture in GDP and employment, 2) a rural-to-urban migration underpinned by rural and urban development, 3) the rise of a modern industrial and service economy, 4) a demographic transition from high rates of births and deaths, and 5) enhanced urban transformative capacity: the collective ability of the stakeholders involved in urban development (Chapter 5).

Frequent flooding causes extensive damage to crops, infrastructure, homes, and businesses. Although high "drought hazard" areas are less densely populated than flood-prone areas, drought severity impacts agricultural productivity by causing crop failures and reducing soil moisture levels, leading to lower crop yields and a loss of income for farming communities.

Both the climate change indicators—floods, droughts, and temperature—and population dynamics variables—dependency ratio, number of earners, education and poverty status (asset-status)—are significantly associated with household agriculture income.

The probability of out-migration is significantly higher in households facing higher indices of flood, drought, and high temperature. There appears to be a complex interplay of factors: climate change factors and high fertility (dependency ratio) negatively affect household wellbeing while education, number of earners, and wealth status affect it positively. The poorer segments of society with low human capital and high fertility are the main sufferers of climate change.

Population Projections

Chapter 3 uses the demographic targets of the CCI with education assumptions for projecting the population in 2050. The CCI set targets to accelerate efforts to increase the CPR and lower the total fertility rate. However, the CCI's targets were very ambitious, and current estimates show that there has been little change. Based on evidence of a slow transition, stalled fertility, and a very marginal increase in CPR, a "business as usual" (BaU) scenario was also developed in the chapter. Under the BaU scenario, the population will reach 386 million by 2050, a 60% increase over the current population. The population will reach 338 million by 2050 under the CCI scenario, nearly 47 million less than the BaU scenario.

Under both scenarios, the share of the young population (0–14 years) will decline, while a corresponding increase will occur in the share of the working-age population. The decline in the size of the younger cohorts is relatively more rapid under the CCI scenario. An improvement in other educational transitions, such as secondary education, will also impact the overall fertility level due to a compositional shift, with more women moving into the low-fertility group. The window of opportunity—an increasing share of the working-age population—is likely to remain open until 2045 or 2050.

Education Demands and Workforce Expansion

Changes in the size and age structure of the population have implications for the education sector (Chapter 3). The number of students at all levels of education is projected to grow from almost 35 million to 60 million between 2023 and 2050. Enrollment at the middle level will more than double (increasing from 9 million to 21 million) and at the high school level (from 4 million to 10 million) between 2023 and 2050. Consequently, the demand for new schools at the middle and high school levels will increase drastically—by 76,000 and 52,000 schools respectively. Similarly, the demand for schoolteachers, particularly at the high and middle school levels, will also increase. Pakistan will need approximately 800,000 new teachers at the high school level by 2050 (there are currently 579,986 teachers at the high school level as of 2021–2022), translating to about 30,000 additional teachers per year from 2023 to 2050.

Labor Market Implications

The Labor market implications of population growth are substantial; the size of the labor force is projected to increase from 82 million in 2025 to 150 million by 2050—a nearly 1.6-fold increase in the next twenty-five years, despite the projected low level of female participation in the labor market. An improvement in female education could bring more women into the labor market. Chapter 3 projects that the number of jobs that should be created annually will increase from 2.55 million at present to almost 3 million in 2035–2040, before leveling off at 2.6 million. Thus, the Government of Pakistan needs to create an additional 13 million jobs in the next 25 years to absorb new entrants into the labor market.

Finally, most of the socio-demographic conclusions drawn from this volume are remarkably consistent with the findings and conclusions of the Population Council's study, *Capturing the Demographic Dividend in Pakistan* (Sathar, Royan, and Bongaarts, 2013). The findings of this volume support the view that without sustained economic growth, it will be difficult to meet the growing population's requirements for better education, health services, and employment opportunities. Rapid demographic transition, particularly the achievement of CCI targets, could support the creation of additional resources, as the analysis in Chapter 4 shows a strong impact of this achievement on economic indicators—higher savings and investment rates and sustained high GDP growth. Thus, the present vicious cycle could be transformed into a virtuous cycle (Chapter 4). At the same time, higher rates of economic growth would alleviate some of the pressure on public services, particularly education and health, which could lead to improved quality in these services, thereby increasing human capital and productivity in the country. Increased human capital and productivity would also provide the necessary conditions for a successful structural transformation of Pakistani society and the economy. This transformation, in turn, is likely to contribute to enhancing society's resilience in meeting challenges related to climate change.

Key Challenges

Based on the conclusions above, the key challenges are as follows:

- Slow fertility transition, low contraceptive prevalence rates, a persistent high population growth rate, and the high economic cost for the nation
- Slow decline in child dependency ratio
- Low human capital investment, particularly low levels of female education, and at the same time, a rising demand for more schools and teachers at all three levels of schooling (primary, middle, and high)
- Massive demand for job opportunities to absorb new entrants in the labor market
- Low labor productivity, and low saving and investment rates
- A rising share of the urban population, but with a stagnant urban manufacturing sector and weak structural transformation
- The added impact of climate change crises in combination with underlying vulnerabilities among the affected population

Policy Options

All the identified challenges are interconnected and require a holistic approach that spans across economic, social, and demographic domains. Multiple pathways necessitate sharp and effective interventions that can shape population dynamics to be conducive to high sustained economic growth, household wellbeing, improved productivity, structural transformation of society and economy, and building resilience against climate vulnerabilities. Policy options for the Government of Pakistan and other stakeholders are outlined.

Enhance Family Planning Services

Ensure that all health facilities, both public and private, offer family planning information and services. Expand universal access to family planning services, particularly for underserved populations, through approaches such as family planning vouchers and doorstep availability of services via an expanded Lady Health Worker Program. More critically, restructure the perverse incentives in the National Finance Commission award that favor population size—shifting the emphasis from population size to social development to better support sustainable progress in each province.

Address the Human Capital Crisis

Take immediate action to ensure universal enrollment of children in schools, as mandated by the Constitution. Construct additional schools to accommodate the growing number of students and develop a comprehensive strategy to meet the increasing demands for schools and teachers across all three levels of education (primary, middle, and high).

Expand Female Labor Force Participation

Actively promote female labor force participation, which currently remains stable at under 25%. Support the transition of women from the informal sector, where economic activity offers low wages and limited opportunity costs, to formal employment with decent work—characterized by a safe work environment and competitive pay; evidence suggests that this can meaningfully influence reducing fertility. Opportunities for such work must be deliberately expanded for Pakistan to observe the negative association between female labor participation and fertility seen in other countries.

Invest in Job Creation and Labor Productivity

Investing in the development of working population groups to fully capitalize on the potential benefits of the demographic dividend. Projections indicate that the active age population is expected to increase from 82 million in 2025 to 135 million by 2050. The government will need to create at least 2.6 million jobs annually to accommodate this burgeoning labor force, enhancing the number of earners at the household level.

Shift Dependency Ratios for Economic Growth

Develop strategies to lower dependency ratios, which can significantly impact household and national income. Shift resources from consumption needs to savings and investment by implementing a two-fold strategy: reduce child dependency through fertility decline and increase the

number of earners by providing job opportunities, particularly for women and new entrants into the labor market, which will contribute to increase savings and investment rates.

Improve Labor Productivity

Take decisive steps to enhance labor productivity by focusing on three key areas: 1) increase investment in capital goods, including infrastructure; 2) provide opportunities for workers to upgrade their skills through affordable education and training, raising productivity for both businesses and the overall economy; and 3) foster the development of new technologies.

Strengthen Urbanization and Structural Transformation

Invest in all three tiers of the economy (agriculture, manufacturing, and services) and empower city governments to improve the quality of urbanization and develop infrastructure that strengthens rural-urban linkages. Consider rural-urban migration as part of the development agenda to transfer workers from the low-productivity agricultural sector to urban manufacturing and services sectors. Develop a comprehensive strategy to utilize the skills of returning overseas workers and maximize the impact of remittances.

Integrate Climate Change with Population Dynamics

Address the interplay between climate change and population dynamics in Pakistan's climate adaptation strategy. Reducing fertility rates can significantly contribute to climate mitigation and adaptation over the next 25 years. As Pakistan prepares for the future in 2050, policymakers must take proactive measures to confront the challenges posed by climate change while incorporating the crucial roles of fertility, population densities, migration, and other aspects of population dynamics. By adopting forward-thinking policies and fostering international cooperation, Pakistan can position itself to thrive in a rapidly changing global landscape.

In conclusion, *Pakistan@2050* is a comprehensive report that provides evidence and insights into the linkages between population dynamics and development by aligning human capital, the economy, structural transformation, urbanization, and climate change. Changes in population dynamics can significantly shape development outcomes in Pakistan. A holistic approach is needed to integrate demographic and economic factors into both short-term and long-term planning and policy decisions.