Productivity Policies for Aging Asia

Asian Productivity Organization

The Asian Productivity Organization (APO) is an intergovernmental organization that promotes productivity as a key enabler for socioeconomic development and organizational and enterprise growth. It promotes productivity improvement tools, techniques, and methodologies; supports the National Productivity Organizations of its members; conducts research on productivity trends; and disseminates productivity information, analyses, and data. The APO was established in 1961 and comprises 21 members.

APO Members

Bangladesh, Cambodia, Republic of China, Fiji, Hong Kong, India, Indonesia, Islamic Republic of Iran, Japan, Republic of Korea, Lao PDR, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Turkiye, and Vietnam.

PRODUCTIVITY POLICIES FOR AGING ASIA

JANUARY 2024 | ASIAN PRODUCTIVITY ORGANIZATION

Productivity Policies for Aging Asia

Dr. Chih-Yu Cheng served as the chief expert of this research project and volume editor.

First edition published in Japan
by the Asian Productivity Organization
1-24-1 Hongo, Bunkyo-ku
Tokyo 113-0033, Japan
www.apo-tokyo.org

Designed by BM Nxt

CONTENTS

FOREWORD

Population aging is one of the most profound demographic transformations of the 21st century, with significant implications for productivity, economic growth, and social well-being. Asia, as the most populous and dynamic region in the world, is experiencing this phenomenon at an unprecedented pace. How Asian countries can harness the potential of their aging populations and ensure a prosperous, inclusive future for all generations has become a point of interest among policymakers in the region.

This publication addresses this important issue by presenting the findings and policy recommendations of three national studies conducted by experts from the Republic of China, Pakistan, and Vietnam. These studies examine the current and projected trends of population aging in those economies, analyze the impact of aging on productivity and economic performance, and explore the roles of digitalization, education, healthcare, and social protection in enhancing the employability and productivity of older workers.

This publication resulting from an APO research project also provides an overview of the main challenges and opportunities of population aging in Asia, as well as the best practices and experiences of other countries in the region and beyond. It highlights the need for a comprehensive, coherent policy framework that can foster a silver economy, where people aged 60 and older can contribute to and benefit from socioeconomic development efforts.

The APO is committed to supporting its members in addressing the productivity challenges and opportunities of population aging. Through its research, training, and technical assistance activities, the APO promotes productivity as a key enabler for meeting the SDGs and building a resilient, inclusive Asia-Pacific region.

The APO hopes that Productivity Policies for Aging Asia will serve as a valuable resource for policymakers, researchers, practitioners, and stakeholders interested in the topic of productivity policies for aging Asia. We expect that it will stimulate further dialogue and cooperation among APO members and partners in advancing the productivity agenda in the region.

Dr. Indra Pradana Singawinata
Secretary-General
Asian Productivity Organization
Tokyo

INTRODUCTION

Background and Objectives

Based on many research findings, "population aging" has become a key factor influential to the global development, including both developed and developing countries. Although many developing countries at this stage can still benefit from their massive population or workforce, the "population dividend" will soon come to an end and lead to negative effects on many countries' social and economic development in the Asia–Pacific region.

As per the UN estimation given in Table 1, due to the falling fertility rate and increasing lifespans, the percentage of global population aged 65 years and above will increase from 9.1% in 2019 to 15.9% by 2050, and the old-age dependency ratio will also increase from 15.9% in 2019 to 28.4% in 2050. Among the economic groups, it is obvious that population is aging more rapidly in high-income countries than in middle- and low-income countries. Also, according to OECD estimation [3], population in the world will increase from 7 billion earlier to 10 billion by 2050, with the major reason behind the increase being longevity.

For the countries to be analyzed in this report, the percentage of those aged 65 and above is expected to increase more rapidly in Vietnam when compared with Pakistan and the Republic of China (ROC). In other words, Vietnam will be confronted with the issues caused by population aging earlier than the other countries because of the decrease in fertility rate and also the increase in life expectancy (See Table 1).

TABLE 1

DEMOGRAPHIC TRENDS IN DEVELOPMENT GROUPS AND COUNTRIES.

Development group, country/ region	Population aged 65+ (1,000)		Percentage of population aged 65+		Total fertility rate		Old-age dependency ratio*	
	2019	2050	2019	2050	2019	2050	2019	2050
World	702,935	1,548,852	9.1	15.9	2.5	2.2	15.9	28.4
High-income countries	226,626	355,620	18.0	26.9	1.7	1.7	30.2	50.5
Upper-middle-income countries	275,611	630,282	10.4	22.5	1.9	1.8	16.7	40.2
Lower-middle-income countries	175,499	482,667	5.7	11.7	2.7	2.2	10.4	20.1
Low-income countries	24,878	79,558	3.3	5.4	4.4	2.9	7.4	10.1
Southeastern Asia	45,378	132,504	6.9	16.7	2.2	1,9	11.5	28.7
Southern Asia	115,255	316,491	6.0	13.2	2.4	1,9	10.6	21.9
India	87,149	225,428	6.4	13.8	2.2	1.8	11.0	22.5
Pakistan	9,361	26,595	4.3	7.9	3.5	2.3	8.5	13.5
ROC								
Vietnam	7,286	22,412	7.6	20.4	2.1	1.9	12.1	36.1

Note: *65+/20~64.
Source: UN [4].

In the face of a rapid demographic change, if individual countries intend to benefit from population aging and also attain sustainable development, the following policy issues should be seriously taken into account [4]:

(1) When population becomes aging, apart from encouraging the participation of aging workers in the labor market, increasing women's participation is of great importance. However, the premise of enhancing female labor force participation lies in the provision of family-friendly policy programs and also flexible employment opportunities. Otherwise, the intent to improve female labor force participation might be obstructed.

(2) Age-related discrimination may be regarded as a major obstacle to aging workers to participate in the labor market. Therefore, in order to ensure an access to fair and inclusive employment opportunities for aging workers, the key policy priority is undoubtedly eliminating age barriers, including age discrimination, in the labor market.

(3) One of the factors influential to the employment of aging workers is whether they require employability or not. In order to maintain or upgrade aging workers' both hard and soft skills, public investment in human capital for all generations, particularly for aging workers, is needed. Accordingly, government policies should focus more on lifelong learning to ensure that aging workers keep up with technology changes and the required flexibility in skills.

(4) Protecting income security for aging workers is essential to secure their financial well-being at older ages. Rather than them relying on their own savings and family transfer, providing a pension system of fiscal sustainability to aging workers is an inevitable responsibility of the government. In addition, increasing the retirement age as life expectancy increases is also important to support labor force participation at older ages.

(5) To achieve inclusive and sustainable development as societies are going through fundamental demographic changes, improving data collection and analysis of the population and economic linkage are vital to the making of government policies. Without data, any individual country would not be capable of responding to challenges of population aging.

In its analysis report concerning the policymaking for an aging society, the ILO [1] has also highlighted the following policy issues, and stressed that it is important to evaluate whether a country is preparing or not to face the challenge of an aging population:

(1) Does a country have policies to deal with demographic change, particularly ageing?

(2) Are those policies directly or indirectly linked to the labor market?

(3) What are the roles of the government and the private sector in a country's policies in association with demographic changes?

For understanding how ASEAN countries are dealing with population aging, the ILO has summarized recent strategies and policies that ASEAN countries have undertaken. These are presented in Table 2, which provides at least a preliminary view of some countries' preparation against population aging.

TABLE 2

RECENT STRATEGIES AND POLICIES LINKED WITH POPULATION AGING.

Country	Grouping and ageing status	Strategies or plans addressing population aging	Action areas linked to labor markets
India	Early dividend; not yet ageing	National Policy on Older Persons 1999 National Policy on Senior Citizens 2011 (not yet approved)	Human resource management and training for elderly care personnel Job placement programs Access to finance for the elderly Extending social protection Preventing age discrimination Regional health centers and home care Social assistance Skills development
Indonesia	Early dividend; not yet ageing	Law No. 13/1998 on the Welfare of Older Persons Regulation No. 43/2004 on Older Persons Welfare improvement efforts	Social assistance Extending social protection Expanding health centers Senior-friendly transport Skills development Human resource management and training for elderly care personnel Home care program
Malaysia	N/A	N/A	Extending legal age of retirement Age-friendly working environment Preferential loans for business startups Job placement support for the aged unemployed Encouraging volunteerism Lifelong learning system for older people
Vietnam	Late dividend; ageing	Law on the Elderly 39/2009 National action plan on elderly people for 2012–20 (2012) Strategy on population and reproductive health for 2011–20	Extending social protection Social assistance Regional health centers and home care Preferential loans for business startups Skills development

Source: ILO, 2019a.

To sum up, in this report, national experts have been encouraged to explore above-mentioned policy issues and see that each country is prepared to face the impact of population aging on social and economic development or even the work of future.

In its centennial report, the ILO points out that new forces are transforming the world of work, and the transition involved creates new opportunities as well as threats to the world. In addition to the impact of the demographic change, the ILO also focuses on the effects of climate change and technological advances. Climate change will definitely disrupt labor markets worldwide, but job gains might be more than job losses if the Paris Climate Agenda could be thoroughly implemented (see Table 3).

TABLE 3

ESTIMATIONS OF FUTURE LABOR MARKET TRANSFORMATIONS.

Transformation force	Estimation
Technology	47% of workers in the USA are at risk of having jobs replaced by automation. 56% of jobs in the ASEAN-5 are at risk of automation over the next 20 years. While less than 5% of all occupations can be automated entirely using demonstrated technologies, around 60% of all occupations have at least 30% of constituent activities that can be automated. An average of 9% jobs in the OECD are at high risk of automation. A substantial share of jobs (between 50% and 70%) will not be substituted entirely but a large share of tasks will be automated, thereby transforming how these jobs are carried out. Two-thirds of jobs in the developing world are susceptible to automation. Nearly 50% of companies expect that automation will lead to some reduction in their full-time workforce by 2022.
Transition to a sustainable environment	Implementing the Paris Climate Agenda is estimated to lead to global job losses of around 6 million and job gains of 24 million.
Demographic change	By 2050, the total dependency ratio (ratio of population aged 0–14 years and 65+ years per 100 population to that aged 15–64 years) is projected to increase sharply in Europe (by 24.8 percentage points) and Northern America (by 14.4 percentage points); and moderately in Asia (by 8.5 percentage points), Oceania (by 6.8 percentage points), and Latin America and the Caribbean (by 7.6 percentage points). The total dependency ratio for Africa is projected to decrease by 18.7 percentage points as half of the region's population will be young (0–24 years). All other regions will have an aging population.

Source: ILO [1].

As for technological advances, although the ILO [2] is concerned with the negative effect of digital technology on both regional and age inequality, the OECD [3] emphasizes that if done right, digital technologies can create new opportunities for the aging population to become independent and active, and work longer than previously possible. In other words, the OECD [3] believes that the convergence of population aging and digital technologies can help foster a silver economy in which people aged 60+ could be more easily interacting and thriving in the workplace and also leading productive lives.

Nevertheless, for ensuring the success of the silver economy, dealing with the challenge that aging workers lack employability and working skills in information and communication technology (ICT) has become of great importance to many countries. Without employability and the required working skills, aging workers might not be able to seize new job opportunities in the silver economy. Therefore, in this report, national experts would also be focusing on the impact of digital transformation on aging workers and trying to sketch government policies, particularly for reskilling programs to help aging workers benefit from the digital economy and gain access to more employment choices.

Accordingly, this report will try to achieve the following objectives:

1. grasping the demographic trend in participating countries;

2. understanding the impact of changing demographic or workforce structure on social and economic developments in participating countries;

3. if possible, studying the development of the silver economy and its impact on aging workers; and

4. collecting and analyzing government/enterprise policies in dealing with changing demographic or workforce structure in participating countries.

Methodology

When carrying out a research, usually both primary and secondary data should be utilized. However, due to the time restraint in completing the project, use of secondary data has been encouraged.

References

[1] ILO. Preparing for the future of work: National policy responses in ASEAN+6. Bangkok: ILO; 2019a. www.ilo.org.

[2] ILO. Work for a brighter future–Global Commission on the Future of Work. International Labour Office. Geneva: ILO; 2019b. www.ilo.org.

[3] OECD. Promoting Active Ageing in the Digital Economy: Inclusion, Adaptation and Innovation; 2015. www.oecd.org.

[4] United Nations. Department of Economic and Social Affairs, Population Division; 2020. World Population Ageing 2019 (ST/ESA/SER.A/444).

OVERVIEW

For this report, experts from three countries, namely, Pakistan, the Republic of China (ROC), and Vietnam were invited. Since these three countries face the impact of population aging by different degrees, their strategies and actions in dealing with population aging may also be different. These strategies and action may also be helpful to other countries dealing with population aging.

Pakistan

Pakistani experts have explored the impact of population aging on economic growth in Pakistan using annual time series data from 1990 to 2020.

In the short term, Pakistan's population aging is not a big problem, given that the population is younger, the fertility rate is low, and the dependency ratio is also low. In the long run, however, due to changes in these factors, population aging will have an adverse impact on national income. Sustainable human development policies and programs are needed, in addition to current socioeconomic policies, to turn this demographic dividend into opportunity.

For Pakistan to reap the benefits of its demographic dividend, it must provide its youth with gainful employment opportunities. From a future policy perspective, as these young workers progress, they will support not only themselves but also those who depend on them. Considering the low literacy rate among women, large-scale holistic design solutions are needed to encourage the idea of small family sizes and lower fertility rates on a voluntary basis.

The ROC

With decline in the birth rate and increase in the life expectancy, the ROC has entered the "aging society" group defined by the UN in 1993. In 2018, it became an aging society. By 2020, the proportion of the population over 65 years old was to be 16.07%. It is estimated that in 2025, it will enter a super-aged society, so how to develop and utilize human resources for middle-aged and elderly people has become an important issue for the ROC. In view of this, the ROC passed the "Employment Promotion Act for the Elderly and Elderly" in 2019 in an attempt to remove regulatory obstacles and promote employment for the elderly.

Vietnam

Vietnam is a low-middle-income country that has experienced population aging over the past decade. It is projected to become a rapidly aging country in the coming decades. Therefore, how to maintain and increase productivity and thus promote economic growth in the context of population aging is an important policy issue for Vietnam.

The study examines the state of productive work in Vietnam by using 2010–20 Labor Force Survey data. The results show that the number of productive workers increased by about 1.5 times (from 14 million to 20.5 million) over this period, but their share of the total labor force fell slightly from 86% to 79%. The study also found that the proportion of people aged 30–44 years and 45–59 years

engaged in productive work was increasing, which is indicative of an important opportunity for Vietnam to seize the "demographic dividend" through these workers.

The study also found that female workers, rural workers, workers with low education, domestic private-sector workers, and workers in the agricultural sector were less likely than others to be productively employed.

Based on these findings, the study recommends seizing the "demographic dividend window" while preparing for "population aging" through adaptive policies and strategies in economic structure, education, and health.

THE ROC

Preface

According to government surveys, the share of the ROC's population aged 0–14 years is decreasing year by year, while the proportion of population aged over 65 years is increasing. As a result, it is obvious that not only the proportion of the elderly population, but also the average age of the ROC's population is increasing.

Under the influence of the dual factors of "population aging" and "fewer children," the government as well as enterprises face the dilemma and pressure of reducing the supply of new human resources. Generally speaking, enterprises can respond to the shortage of human resources by means of transnational investments, automated production, or asking the government to open up the import of immigrant manpower. However, regardless of the response method, given that "fewer children" has almost become a common problem in many countries, and based on the premise that immigrant manpower cannot be imported in unlimited numbers, it seems that the government and enterprises should carefully consider whether they should follow the trend of making "the development and utilization of middle-aged and elderly human resources" a key countermeasure to deal with "population aging."

Observing the comparison of labor force participation rates between the ROC and other countries, it can be seen that the ROC's middle-aged and elderly labor force gradually withdraw from the labor market between the ages of 50 and 54, forming a phenomenon of "early leave." (see Table 1). There are many reasons for middle-aged and elderly workers to withdraw early from the labor market, including personal wishes, employers' wishes, or market prosperity. In any case, the "early leave" of middle-aged and elderly workers is not a phenomenon that the ROC is happy to see in response to the aging of its population and also the labor force. Therefore, assisting middle-aged and elderly workers to stay in the workplace should be of great importance and necessity.

TABLE 1

LABOR FORCE PARTICIPATION RATES IN MAJOR COUNTRIES BY AGE GROUPS.

Age	ROC	ROK	Singapore	Japan	USA
Total	59.0	63.1	67.7	61.5	62.9
15~19	9.3	8.2	15.2	19.5	35.1
20~24	56.4	48.9	61.3	74.3	71.1
25~29	93.4	76.9	90.0	89.2	82.3
30~34	91.9	78.9	91.0	86.5	82.7
35~39	87.1	77.8	89.0	85.6	82.7
40~44	84.3	79.6	88.8	88.1	83.0
45~49	84.0	82.2	86.5	87.7	82.3

(Continued on next page)

(Continued from previous page)

Age	ROC	ROK	Singapore	Japan	USA
50~54	73.5	79.7	82.0	87.1	79.3
55~59	55.6	74.7	75.1	83.4	72.3
60~64	36.7	61.4	62.2	70.6	57.1
65 and above	8.4	32.2	27.8	24.7	19.6

Source: Ministry of Labor, the ROC [6].

In response to the impact of the aging labor force on the ROC's labor market, the concerned government agency enforced the Employment Promotion Act for the Middle-aged and Elderly Persons in 2020. However, if analyzed in detail, this special act focuses more on the re-employment of middle-aged and elderly persons and on planning and designing re-employment measures and programs. Since there is less focus on the design and plan for middle-aged and elderly in-service workers, there remains doubt whether the phenomenon of "early leave" can be eased or not. Therefore, this study has three main objectives:

(1) analyzing the ROC's labor force participation of middle-aged and senior persons and the employment promotion act, and ascertaining the deficiencies or areas of improvement;

(2) collecting and analyzing other countries' employment measures (see Table 1) and programs for stabilizing middle-aged and elderly in-service workers; and

(3) based on the aforementioned analysis, proposing relevant policy recommendations for the ROC.

Employment Situation of Middle-aged and Elderly Persons in the ROC

According to the data from the Statistics Office of the Ministry of Labor, the number of middle-aged and elderly labor force over the age of 45 was 4.795 million in 2020, which was an increase of 66,000 or 1.4% over 2019. Furthermore, the labor force participation rate for those aged 45 to 64 was 64%, and the participation rate for workers over the age of 65 years was 8.8%, both of which increased by 0.5 percentage points compared with 2019. However, the total labor participation rate was 45%, which was a slight decrease of 0.1 percentage points, mainly because the labor force continues to be tilted toward the elderly and their labor participation rate is low [6].

Observed by gender, the labor force participation rate differences between genders are still quite obvious. In 2020, the labor for participation rates for middle-aged and elderly men and women were 55.7% and 35.2%, respectively, and the gender gap was 20.4 percentage points. Looking at each age group, the gender gap in each age group in the ROC in 2019 ranged from 20.3 to 28.0 percentage points [6].

However, from the perspective of the increase in the number of employed people, in 2020, there were 2.759 million middle-aged and elderly men accounting for 58.8%, and 1.932 million women accounting for 41.2% [6]. Sector wise, 1.094 million middle-aged and elderly workers were

employed in the manufacturing industry, followed by 782,000 in the wholesale and retail industry, and 454,000 in the construction industry (see Table 2).

TABLE 2

EMPLOYED PERSONS BY AGE AND INDUSTRY IN THE ROC.

Unit: Thousand persons.

Items	Total	45~49 years	50~54 years	55~59 years	60~64 years	65 years and over
Total	4,691	1,431	1,312	1,019	608	321
Agriculture, forestry, fishing and animal husbandry	405	53	76	89	83	104
Goods-producing industries	1,604	538	457	355	198	56
Mining and quarrying	2	0	1	1	0	0
Manufacturing	1,094	399	316	226	117	36
Electricity and gas supply	17	3	3	5	5	1
Water supply and remediation activities	39	10	10	9	7	2
Construction	454	125	128	114	69	18
Services-providing industries	2,638	841	778	575	328	161
Wholesale and retail trade	782	230	212	167	102	71
Transportation and storage	196	58	58	44	26	10
Accommodation and food service activities	293	86	79	68	40	20
Information and communication	64	27	16	13	6	1
Financial and insurance activities	172	66	56	34	13	2
Real estate activities	41	13	13	10	4	1
Professional, scientific, and technical activities	119	40	40	25	11	3
Support service activities	165	39	43	40	29	13
Public administration and defense; compulsory social security	168	52	54	35	21	6
Education	260	102	88	45	20	5
Human health and social work activities	131	47	37	28	13	6
Arts, entertainment, and recreation	35	10	10	8	5	2
Other service activities	255	69	71	57	37	21

Source: Ministry of Labor, the ROC [6].

In 2020, 1,581,000 middle-aged and elderly employed persons were engaged in craft and machine operation-related work, followed by 902,000 in service and sales work, and 762,000 as technicians and assistant professionals (see Table 3). By class of worker, 3,167,000 middle-aged and elderly employed persons were paid employees, followed by 929,000 own-account workers (see Table 4).

TABLE 3

EMPLOYED PERSONS BY AGE AND OCCUPATION IN THE ROC.

Unit: Thousand persons.

Item	Total	45~49 years	50~54 years	55~59 years	60~64 years	65 years and over
Total	4,691	1,431	1,312	1,019	608	321
Legislators, senior officials, and managers	256	68	75	59	36	18
Professionals	398	173	127	62	27	9
Technicians and associate professionals	762	272	232	156	79	23
Clerical support workers	417	165	128	82	36	6
Service and sales workers	902	250	244	199	127	82
Skilled agricultural, forestry, and fishery workers	375	47	69	82	76	101
Craft and machine-operations-related workers	1,581	456	437	379	227	82

Source: Ministry of Labor, the ROC [6].

TABLE 4

EMPLOYED PERSONS BY AGE AND CLASS OF WORKERS IN THE ROC.

Unit: Thousand persons.

Item	Total	45~49 years	50~54 years	55~59 years	60~64 years	65 years and over
Total	4,691	1,431	1,312	1,019	608	321
Employers	314	69	84	81	51	29
Own-account workers	929	165	214	214	171	165
Unpaid family workers	292	66	71	68	47	40
Paid employees	3,167	1,132	942	657	339	87
Private	2,716	987	804	564	284	77
Government	439	145	137	92	55	10

Source: Ministry of Labor, the ROC [6].

In 2020, there were 5,870,000 middle-aged and elderly people who were not in the labor force. The main reason for them not being in the labor force was "old age," followed by the reason "housekeeping" (see Table 5).

In total, there were 234,000 middle-aged and elderly persons who still had the willingness to participate in the labor market, and their expected salary was around NTD34,000 per month. The occupations they wanted to engage in were craft and machine-operations-related work. More than 80% of them still hoped to find a full-time, non-temporary, and dispatched work, and only 20% of them wanted to become part-time, temporary, or dispatched workers, as per the Ministry of Labor.

TABLE 5

PERSONS NOT IN LABOR FORCE BY AGE AND REASON FOR NOT BEING IN THE LABOR FORCE.

Unit: Thousand persons.

Item	Total	45~49 years	50~54 years	55~59 years	60~64 years	65 years and over
Total	5,870	277	443	768	1,029	3,353
Intend and be available to work but not seeking	81	27	23	21	8	2
Attending school or re-brushing to take entrance exams	34	11	8	5	4	6
Housekeeping	2,195	187	294	459	562	693
Old age or disable	2,627	5	5	8	9	2,600
Others	933	47	114	275	445	52

Source: Ministry of Labor, the ROC [6].

The ROC's Employment Promotion Act for Middle-aged and Elderly Persons

The Employment Promotion Act for the Middle-aged and Elderly Persons in the ROC has nine chapters and 45 articles. In addition to the three chapters of general provisions, penalties, and supplementary provisions, the remaining six chapters include prohibiting age discrimination, measures to stabilize employment, promoting employment of the unemployed, supporting re-employment after retirement, promoting silver-haired talent services, and job opportunities development. Among them, those related to stable employment of in-service workers should mainly be based on the provisions of the two chapters titled "Measures to Stabilize Employment" and "Prohibition of Age Discrimination." However, as mentioned earlier, the act focuses less on the design and planning for the middle-aged and elderly in-service workers. Subsequent discussions will therefore focus on the relevant provisions of "employment stabilization measures."

According to the relevant regulations in the chapter on "Measures to Stabilize Employment," the government generally has the following four methods to assist enterprises in stabilizing middle-aged and elderly employees:

(1) subsidize enterprises to carry out on-the-job training for middle-aged and elderly employees, as per Article 18 of the Act;

(2) provide middle-aged and elderly employees with job redesign or occupational devices, or refer appropriate long-term care service resources to family members who need long-term care, as noted in Article 19 of the Act;

(3) promote the inheritance of technology and experiences of middle-aged and elderly employees and the promotion of inter-generational cooperation through job sharing and other methods (Article 20); and

(4) subsidize employers to continue employing employees who are eligible for mandatory retirement (Article 21).

According to the provisions of the chapter on "Measures for Stabilizing Employment," the competent government agency has also formulated "Regulations on Employment Stability for Middle-aged and Elderly Employees" in an attempt to achieve the goal of employment stability for the middle-aged and elderly employees. According to these regulations, the employment stabilization measures include four items: (1) subsidy for vocational training; (2) counseling and subsidy for job redesign and occupational devices; (3) counseling and reward for inter-generational cooperation; and (4) subsidy for continued employment. These are discussed below in more detail.

Subsidy for Vocational Training

When the employer assigns middle-aged and elderly employees to participate in vocational training, the subsidy from the central competent authority is limited to the training courses openly provided by domestic training institutions (as per Article 4 of the Act). The maximum amount of subsidy is 70% of the training cost, but the upper limit of the total subsidy should not exceed the amount announced by the central competent authority (Article 6).

Counseling and Subsidy for Job Redesign and Occupational Devices

Employers may apply to the competent authority for counseling or subsidy for job redesign or occupational devices, with the amount of subsidy limited to NTD100,000 per employee per year (Article 11).

According to the regulations, the counseling or subsidy items for job redesign or occupational devices include the following:

(1) **Provision of occupational devices:** This is about use of assistive devices to eliminate work obstacles for middle-aged and elderly employees and to maintain, improve, and increase their employability.

(2) **Improvement of working equipment or machinery:** This is to improve the work efficiency and productivity of middle-aged and elderly employees.

(3) **Improvement in the working environment in the workplace:** In order to stabilize the employment of middle-aged and elderly employees, improvements related to the workplace environment are carried out.

(4) **Improvement in working conditions:** The necessary work assistance is provided to improve the working conditions of middle-aged and elderly employees.

(5) **Adjusting working methods:** Through analysis and training and appropriate work according to the characteristics of middle-aged and elderly employees are arranged (Article 12).

Counseling and Reward for Intergenerational Cooperation

The term "intergenerational cooperation promotion" refers to the method by which employers employ middle-aged and elderly employees to work together with other employees with age gaps of 15 years or more through the same work division using cooperation, adjustment of content, and other methods (Article 17).

According to the regulations, the ways for employers to promote intergenerational cooperation include the following:

(1) **Talent cultivation type:** Middle-aged or elderly employees mentor or coach cross-generational employees to pass on knowledge, technology, and practical experience.

(2) **Job-sharing type:** Different generations work together to develop complementary roles or time in division of labor, with both the parties having common working hours.

(3) **Mutual mentorship:** Expertise of different generations is combined, wherein both parties serve as mentors to each other to jointly improve operational efficiency.

(4) **Complementary competence:** This involves reorganizing job, planning job, or adjusting performance based on the job competences of different generations.

(5) **Others:** Other ways are used to promote intergenerational cooperation (Article 18).

The central competent authority may publicly commend, and issue trophies (plates) and rewards to employers who have performed well in promoting the intergenerational cooperation projects mentioned in the preceding article (Article 19)

Subsidy for Continued Employment

Employers who apply for continuing subsidy should meet the following criteria:

(1) They should continue to employ employees who meet the requirements of subparagraph 1, paragraph 1, Article 54 of the Labor Standards Act, and have up to 30% of the total number of employees who meet the requirements.

(2) The period of continued employment should be more than six months.

(3) The salary during the continuous employment period should not be lower than the previous salary (Article 20).

The subsidy for continued employment should not be counted if the number of days of employment is less than 30 days, and should be issued according to the period of continued employment by the employer. The regulations include:

(1) Where the employer and the employee agree to pay wages on a monthly basis, the payment should be made according to the following criteria:

- If the employer continues to employ for six months, starting from the first month of employment, a monthly subsidy of NTD13,000 will be given for each employee according to the number of employees, and a six-month employment subsidy will be paid at a time.

- If the employer continues to employ for more than six months, starting from the seventh month, a subsidy of NTD15,000 per person per month will be granted on a quarterly basis, with a maximum subsidy period of 12 months.

(2) Where the employer and the employee agree to pay wages in a manner other than that discussed above, the payment will be made according to the following standards:

- If the employer continues to employ for six months, starting from the first month of employment, a subsidy of NTD70 per person per hour will be given according to the number of employees, with a maximum of NTD13,000 per month. Employment allowances are paid for six months at a time.

- If the employer continues to employ for more than six months, starting from the seventh month, a subsidy of NTD80 per person per hour will be given to the employer, with a maximum of NTD15,000 per month, issued quarterly. The maximum subsidy period will be twelve months (Article 22).

Generally speaking, most of the measures to stabilize the employment of middle-aged and elderly employees in the Act are to help the middle-aged and elderly employees stabilize their employment, including training subsidies, job redesign, and intergenerational cooperation. Even so, according to the labor force participation rate of middle-aged and elderly workers in the ROC, many middle-aged and elderly workers leave the labor market in large numbers after the age of 50 or 55. However, the subsidy object of the "Continued Employment Subsidy" in the special act are those employees who meet the retirement requirements of the Labor Standards Act, i.e., employees who are about to reach the mandatory retirement age of 65. In other words, it seems that with the "Continued Employment Subsidy" measure, it is difficult to achieve the purpose of stabilizing the employment of the middle-aged and elderly workers.

There are many measures to help middle-aged and elderly employees stay in the workplace, and employment subsidy is only one of them. How to construct more complete measures for the ROC to achieve the goal of stabilizing employees, particularly at the age of 50 and above, to ease the phenomenon of "early leave" should be the major concern. Referring to experiences of other countries might be a good option.

Experiences that Can be Learned from Other Countries

Implementing Incremental Retirement Measure

The so-called "incremental retirement" refers to the mode in which workers gradually switch from full-time work to part-time work before full retirement by reducing working hours or adjusting job positions. A person in the period of "incremental retirement" can basically receive salary and partial pension, and so, this system is also called Partial Pension System (PPS). Sweden implemented the PPS in 1976, providing a way for workers to gradually transition from full-time employment to full retirement. For workers who receive partial pension, their weekly working hours must be reduced by at least 10 hours compared with those who have not received partial pension before, but the total weekly working hours still need to reach at least 17 hours [9]. In addition, the UK has also designed a special pension system that allows middle-aged and elderly workers to receive a part of their pension while working, thereby encouraging them to stay in the workplace.

According to Zhang Yunxiang's [10] study, the "incremental retirement" practices that Japanese companies implement for middle-aged and elderly employees include the following pointers:

(1) Specialize the work, take the job salary as the benchmark, supplement it with professional allowances as a means of salary adjustment, and establish a personnel management system

that does not increase the salary if you do not promote. This is similar to the current salary system for university faculty members or civil servants in the ROC.

(2) Introduce a hierarchical system of professional ability qualifications, while promotion has nothing to do with positions. The same position can also expand the number of people according to needs, increasing the flexibility of job redesign, so as to establish a consistent salary and promotion system.

(3) When the middle-aged and elderly employees reach the retirement age, the method of extending employment is not only shortening working hours and gradually reducing the hours, but also switching to a subsidiary company for continuous employment.

Upgrading Working Skills of Middle-aged and Elderly Workers

In 2012, the Republic of Korea (ROK) launched the "50+ New Workplace Adaptation Support Program," hoping to help job seekers over the age of 50 to work in small and medium-sized enterprises through on-the-job training [4]. Singapore improves the skills of "middle-aged and senior-aged workers" by subsidizing the training costs of middle-aged and elderly professionals for small and medium-sized enterprises. Germany's practice is to fully subsidize workers above the age of 50 years, employed by small and medium-sized enterprises with less than 100 employees, to participate in the company's external training costs.

Incentive Measures to Increase the Willingness of Enterprises to Hire

In order to encourage business owners to hire middle-aged and elderly workers, Sweden promotes the "New Start Job Program" and provides many incentives to encourage employment, including reducing or exempting employers from special payroll tax, providing middle-aged and elderly workers with working tax credit, and supplementary tax breaks for employing elderly unemployed workers, among other things. German companies employing workers over the age of 50 can obtain wage subsidies of up to three years and up to 50% [9].

Singapore adopts the method of reducing labor medical welfare costs borne by employers who employ middle-aged and elderly workers, and encourages enterprises to hire middle-aged and elderly workers. In addition, middle-aged and elderly workers over the age of 50 can receive government subsidies (25% of the total salary within three months or USD1,000, whichever is lower); and provide about USD1,200 for one year or USD1,800 for one-and-a-half years as cash subsidy to encourage enterprises to retain middle-aged and elderly employees with low education levels [9].

The ROK implements a standard employment rate system, which stipulates that large companies with more than 300 employees must employ a certain percentage of elderly people according to the type of the industry. For example, the share of the elderly employed is 2% in the manufacturing industry; 6% in the transportation industry, real estate, and leasing industries; and 3% in other industries [8]. In addition, the ROK government also encourages enterprises to implement a "salary decline system." Through negotiations between the employer and the employee, the employer reduces the burden on the employer by reducing the salary or shortening the working hours of the employee year by year before retirement; and promotes the employment stability of middle-aged and elderly people. At the same time, the government subsidizes part of the difference before and after the reduction of labor wages to support the protection of the rights and interests of middle-aged and elderly laborers [9].

In Japan, the "Continued Employment System" is implemented in conjunction with the "Elderly Employment Stabilization Law." Employers and employees can renegotiate wages, working hours, and other working conditions based on this system to reduce the cost of employing middle-aged and elderly workers and to promote employment stability. After the introduction of this measure, if the wages of workers are greatly reduced, then "employment insurance" will also provide part of the subsidy for the difference. "Employment Guarantee Subsidies for the Elderly" is to improve the working environment for middle-aged and elderly people, increase employment, and extend the employment period of middle-aged and elderly people in enterprises [9].

Shaping the Employment Atmosphere and Consensus for Hiring Middle-aged and Elderly Workers

Since 2001, the American Association of Retired Persons, now known as AARP, has issued the "AARP Best Employers for Workers over 50 Award" to widely publicize the practical experience of employing the elderly. The Department of Labor, USA vigorously promotes the "Senior Community Service Employment Program" and the importance of elderly workers to the labor market in an attempt to change the attitude of employers. The Ministry of Manpower, Singapore, together with the National Trades Union Congress and the National Employers Federation, formed the "Tripartite Committee on the Employment of Older Worker" through regular dialogs and forums, to change employers', workers', and the society's perceptions and attitudes towards aging labor, in order to solve the problems of labor shortage and population aging. At the same time, the "Ministerial Committee on Aging" (MCA) was established in 2007 to integrate the resources of various ministries at the cabinet level to enhance social participation and jointly face the issues of the aging society [9].

Employment Subsidy

In Japan, the government legislates to reduce age discrimination in the job market, through measures such as the Employment Stability Law for the Elderly and the Labor Standards Law. It is stipulated that since October 2001, age criteria can be set for certain special industries, but no age restriction is allowed for industries not listed. In addition, in order to increase the number of employees, the Japanese government, in addition to abolishing the 60-year-old retirement system, also provides salary subsidies for companies employing middle-aged and elderly workers. Singapore provides companies with "Job Re-design Grants," "Training Grants," and "Special Employment Credit." Organizations that employ seniors over the age of 50 years with a monthly salary of no more than SGD4,000 can receive a monthly subsidy of 8% of the employee's salary, with a maximum amount of SGD240 [9].

Conclusions and Suggestions

There is an economic imperative for policy reform and cultural change regarding population aging and technology. The number of people over the age of 60 years will reach 1 billion by 2020 due to declining fertility rates and increased longevity. The world population will increase from 7 billion to 10 billion by 2050, with one-third of this increase being due to longer life spans. In OECD countries, within two years, the number of people leaving the labor force will exceed the number of people entering the labor force, which will increase the pressure on the national old-age pension and welfare system [7].

However, at a time when the global economy requires middle-aged and older workers to work long hours, technological innovation has reduced the employability of middle-aged and older workers

due to their lack of information, computer, and telecommunication (ICT) skills. The number of middle-aged and elderly workers in OECD countries participating in work-related training is less than that of young and middle-aged workers. Once unemployed, middle-aged and elderly workers face a high risk of being unable to return to work or long-term unemployment. New ways of working are becoming more prevalent, creating greater flexibility for employers and individual middle-aged and older workers, but they also face greater risks of job insecurity. To cooperate and find solutions between public and private sectors is a big challenge [7].

The rapid digital transformation presents a unique opportunity for countries to turn aging populations into an avenue for growth. Through the use of ICT and the internet, there are new possibilities for active, healthy, and productive aging, offering many possibilities and opportunities for individuals, families, and the society.

The right use of digital technology can enable the world's aging population to remain independent and active, and work longer than ever before. Advances in healthcare, telemedicine solutions, transportation, and urban living are just some of the ways by which middle-aged and elderly populations can benefit from the digital economy. More broadly, technology can create an inclusive work and living environment and help foster a silver economy where people aged 60 years and above can communicate, interact, and innovate in the workplace business and maintain a healthy and productive life. Nevertheless, a reskilling program is needed to help the middle-aged and elderly benefit from the rapidly developing digital economy, maintain their employability, and have better employment options. Recent evidence shows that between 2003 and 2013, reskilling led to increased employment among the middle-aged and older people in most G20 countries [7].

In addition to paying attention to the impact of digital technology development on middle-aged and elderly workers, based on the experience of other countries, the ROC can also strengthen the employment of middle-aged and elderly persons, including the planning and promotion of the measures discussed below.

(1) Promotion of incremental retirement measures, without compromising the security of labor retirement benefits can be a key factor for the success of incremental retirement measures.

(2) The age for the ROC's middle-aged and elderly workers to quit the labor market is between 50 and 55 years, but incentives for middle-aged and elderly employees to stabilize their employment start before the statutory mandatory retirement age. To achieve the goal of stable employment, it may be useful to refer to Singapore's "Special Employment Subsidy" and lower the age for stable employment subsidies to 50 years of age.

References

[1] Lu B-b. A Preliminary Exploration on the Application of the Elderly Labor Policies in Britain, the United States, Japan and South Korea from the Perspective of Production Aging, Journal of Welfare Technology and Service Management 2018; 6(4): 403–414.

[2] Ministry of Labor, the ROC. Labor Statistics; 2020.

[3] OECD. Promoting Active Aging in the Digital Economy: Inclusion, Adaptation and Innovation; 2015. www.oecd.org.

[4] Su Y. South Korea's Elderly Human Resource Policy (Part 1); 2017. retrieved from: https://www.italent.org.tw/ePaperD/7/ePaper20170900003.

[5] Zhan H., et al. Research on Feasibility Plan for Delayed Retirement, a research project sponsored by the Ministry of Labor, the ROC; 2015.

[6] Zhang Y. The Development of Japan's Incremental Retirement System; 2015. http://itriexpress.blogspot.com/2015/01/blog-post_21.html.

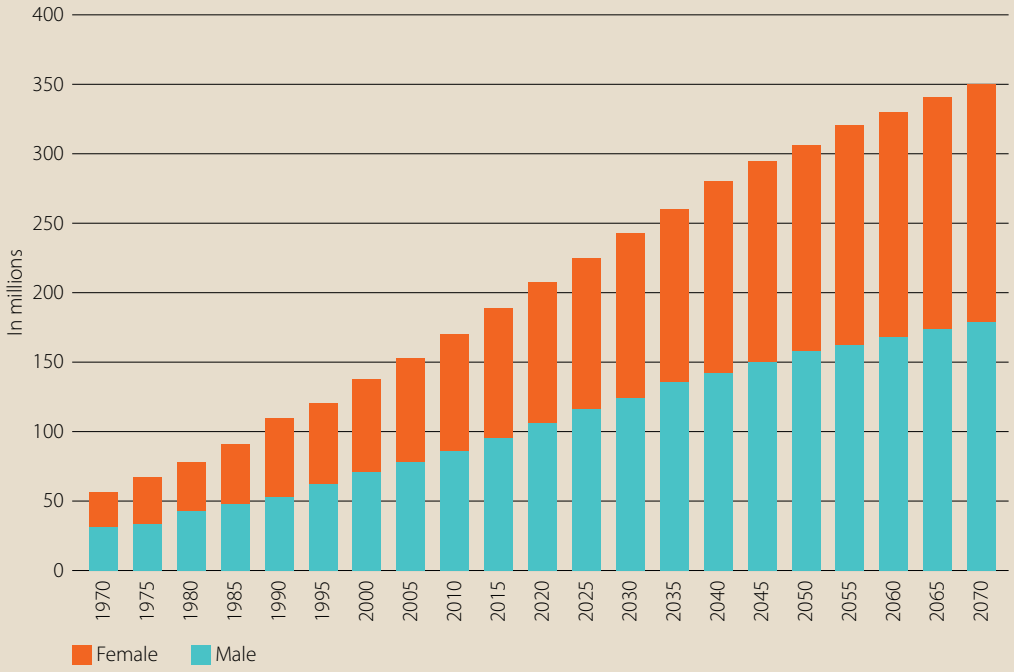
PAKISTAN

Demographic Profile of Pakistan

Pakistan is the world's sixth most populous country. The country's last census in 2017 counted 208 million inhabitants, with an annual population growth rate of 2.4% since the previous census of 1998, as per Pakistan Bureau of Statistics [16]. This growth rate drove the population upward by an additional 48 million people during 1981–98 and 75 million during 1998–2017. This growth rate means that, if nothing changes, Pakistan's population will double in only 29 years, whereas the average doubling time for other south Asian countries is around 58 years [4]. According to the most recent UN projections, the population could increase by a further 83 million in the next 20 years and reach 367 million by 2060.

FIGURE 1

POPULATION GROWTH OF PAKISTAN.



Source: World Population Prospects, UN, 2017 revisions.

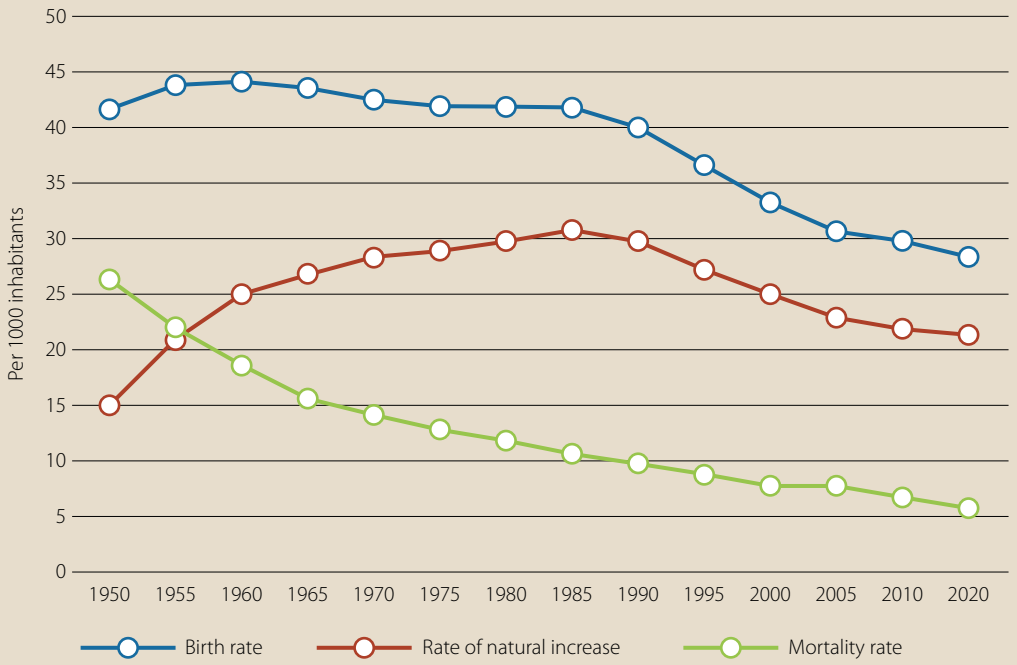
Demographic Transition: Fertility Rate, Life Expectancy, and Mortality Rate

Over the past three decades, Pakistan's demographic profile has changed with a declining fertility rate, an increase in life expectancy, and a decrease in the mortality rate. The total fertility rate (TFR) in Pakistan had declined slowly from around five children in 1990–91 to four children by 2006–07. Since then, the movement toward moderate fertility has proceeded very slowly, from 4.1 in 2006–07 to 3.6 in 2017–18 (PDHS Survey, 2007). Pakistan is at a stage in its demographic transition where declining fertility has stalled the increase in dependents while the workforce remains large due to the high fertility rate earlier. The crude death rate was as high as around 27

per 1,000 in 1950–55 but had declined to 7 per 1,000 by 2015–20. Further, life expectancy was 63 years in 2000, which increased to 67 in 2015 and further increased to 69 in 2019. Life expectancy is defined by OECD as "if current death rates do not change, how long, on average, a newborn can expect to live."

FIGURE 2

POPULATION SIZE AND GROWTH IN PAKISTAN 1970–2070.



Source: Labor Force Survey, 2018–19 [11].

Population Aging

Like the rest of developing countries, Pakistan is also experiencing an aging of its population. According to UN population projections, the share of the elderly population aged 60 years and above in Pakistan would be 15.1% of the country's total population by 2050. At present, 11.6 million people (6.5% of the total population) are over 60 years old and in 2050, the number would be 43 million (15.8% of the total population), as given in Table 1.

TABLE1

PAKISTAN'S ANNUAL MEAN INCREASE OF OLD-AGE POPULATION FROM 2020 TO 2050.

Age group/growth (year)	2000–20		2020–50	
	Males (%)	Females (%)	Males (%)	Females (%)
60–64	3.20	3.13	3.28	3.26
65–74	3.09	2.96	3.29	3.33
75+	3.58	4.21	3.77	4.22
Total population	9.87	10.3	10.34	10.81

Source: The UN [21].

In developing countries, the process unfolds over a period of two or three decades as an inevitable consequence of successful family planning programs leading to demographic transitions, i.e., shifts from high to low birth and death rates.

Population Dynamics: Youth Bulge

Pakistan has a remarkably young-age population. In 2010, nearly two-thirds of the country's population was less than 30 years old with a median age of 21.7 years. The characteristic of young-age population has been persistent in Pakistan for the last five decades. The share of school-age population (0–14 years old) was, on an average 40%, from 1950s till 2000, and was estimated at 36% (61 million) in 2010. The share of working-age population (15–64 years old) grew from 54% in the 1950s to 61% by 2010. Currently, the south Asian region, along with sub-Saharan Africa, is the only region in the world with a young-age population structure and significant population growth. Within south Asia, Pakistan stands out with the highest population growth rate and a very young-age structure. In 2010, 35% population of Pakistan was aged below 15 years and 60% of the population was in the working-age group of 15–64 years. This rising share of the working-age population could translate into a subsequent rise in the rate of economic growth if the country could employ them effectively. In this context, human capital will be central to the realization of this window of opportunity for rapid economic growth.

Female Labor Force Participation

According to the Labor Force Survey 2018–19, the refined labor force participation rate was 67.7% among males and 21.5% among females, while in rural areas, it is 68.9% for males and 28.6% for female. Also, the unemployment rate jumped from 5.8% in 2017–18 to 6.9% in the 2018–19, as per the LFS [11]. It was 5.9% among males and 10.0% among females. Around 7 million women working in agriculture fell in the category of contributing family workers and remained unrecognized and unpaid.

Results show that Pakistan's female labor force participation rate is among the lowest in south Asia, like India and Afghanistan. The difference in the labor force participation rate between males and females in Pakistan is 60.19%. Furthermore, observing the difference in the labor force participation rate by age groups, the male participation rate is 61.29% while the female participation rate is 22.63% in the age group of 15–24 years. However, the difference in the participation rate decreases up to 38.66% for the age group of 25–44 years as although women got married and had children, they participated more in the job market. Still, the gap between men's and women's earnings has increased. In 2018–19, women earned just 18% of what men earned. Low labor force participation is also closely associated with the literacy rates of males and females (see Table 2).

TABLE 2

LITERACY RATES FOR MALES AND FEMALES AGED 10 YEARS AND ABOVE.

2013–14			2014–15			2017–18			2018–19		
Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
60.4%	71.3%	48.4%	60.7%	71.6%	49.6%	62.3%	72.5%	51.8%	62.4%	73.0%	51.5%

Source: Labor Force Surveys of Pakistan.

The Adolescent and Youth in Pakistan (AYP) survey in 2001–02, considered the largest nationally representative survey of young Pakistanis, revealed the asymmetry in experiences of young women

and men in growing up. In most instances, gender disparities were further exacerbated by low socioeconomic status and rural residence: girls from the poorest families in rural areas were the most disadvantaged in every aspect. For both male and female youths, there appears to be a large lag in years between the assumption of adult work roles (whether in a domestic setting or in the labor market) and the assumption of adult family roles as marked by the timing of the first marriage. In case of young women, the delay in the timing of first marriage has increased in recent years, accompanied by a rise in the percentage of women working for pay during their later adolescent years. However, a similar trend is not apparent for young men [17].

Dependency Ratio

Dependency ratio is defined as the ratio of economically active workers to inactive workers (i.e., the ratio of the population aged 0–14 years and 65 years and above to the population aged 15–64 years). In general, the dependency ratio includes the children dependency ratio and the elderly dependency ratio. A high ratio means those in the working age and the overall economy face a greater burden in supporting the aging population. Table 3 shows that age dependency decreased continuously over the period from 2011 to 2020, with a decrease of 6.8% observed in the burden of the elderly.

TABLE 3

POPULATION AND AGE-DEPENDENCY RATIO, 2011–20.

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Population in million	183.34	187.28	191.26	195.31	199.42	203.63	207.91	212.22	216.56	220.89
2	Population growth rate in %	2.2	2.16	2.13	2.1	2.09	2.09	2.08	2.06	2.02	1.98
3	Population aged 65 years and above (as % of total population)	4.26	4.28	4.29	4.30	4.31	4.31	4.31	4.31	4.32	4.34
4	Age-dependency ratio (as % of working age population)	71.18	70.16	69.16	68.22	67.35	66.70	66.09	65.51	64.95	64.38

Source: Labor Force Survey, 2018–19.

Demographic Window of Opportunity

A country is considered to have a "demographic window of opportunity" when the share of children (0–14 years of age) is less than 30% and the share of old people (aged 65 and over) is less than 15%. Demographic changes have brought about "demographic windows of opportunity" with various benefits and challenges to the economic growth and development. Therefore, governments, especially those in developing world, are interested in how to turn a "demographic window of opportunity" into a "demographic dividend." There is growing concern within and outside Pakistan that a central development challenge lies in how the country addresses the rapid growth of its population, which, if left unchecked, could exert a drag on the economic growth and delay the onset of the demographic dividend.

Impact of Digitalization

It was also found that digitalization can influence the working-age population and labor market, enhance energy intensity, and stimulate the economic growth of a nation, while the demographic dividend also has a strong effect on overall economic performance in the digital era. More online employment opportunities are now globally available than ever before, and a substantial pool of technologically skilled young people in developing nations is getting access to these jobs. In case of emerging economies, during the last few decades, the trend of advancement of technology has built an innovative pathway to the digital economy for sustainable development [21].

In 2020, 71% of the world's youth aged between 15 and 24 years were using the internet, compared with 57% for the remaining age groups. On the global scale, young people were thus 1.24 times more likely to connect than the rest of the population [10], which in turn could improve the development prospects of regions having young population. The greater uptake among young people bodes well for connectivity in areas where the demographic profile is skewed toward the youth, such as the least developing countries, where half of the population is less than 20 years old. It means that the workforce will become more connected and technology savvy as the young generation joins its ranks.

Pakistan Vision 2025 aims to "channelize and streamline the energies of Pakistan's large youth population and realize their immense economic potential," noting in particular the youth-based "strong digital potential to develop a knowledge-based industry fostering innovation and entrepreneurship." Pakistan's 61 million young citizens can also be key enablers of wider development outcomes. According to Pakistan Telecommunication Authority (PTA), the monthly teledensity of Pakistan in December 2021 was 87.08, and there were 61.34 million internet users in the country in January 2021. The number of internet users in Pakistan increased by 11 million (21%) between 2020 and 2021.

Literature Review: Aging Population and Economic Growth

Lee and Mason [23] for instance, affirm that when population is in the period of "demographic window of opportunity" (i.e., when the working-age population doubles the non-working-age population), the labor force, which accounts for a high share of the total population and keeps increasing, will positively influence the economic growth and countries can achieve the "demographic dividend." Also, changes in the proportion of working-age population tend to have a significant direct impact on per capita income [12]. To reap this demographic dividend, however, prompt action must be taken to ensure that the swelling cohorts of working-age people are productively employed [1]. Kelley and Schmidt [14] studied the impact of population's age-structure-related changes on economic growth in various countries, using different demographic variables such as, youth dependency ratio, old-age dependency ratio, population size, and population density as determinants of income per capita growth.

Educating females, just as males, directly increases the stock of human capital and income, and promotes growth. However, there is a further benefit of educating females because of the positive influence of mothers on the education and health of their children [19]. In a low-income, agriculture-dominated economy, women are active participants in the labor force as contributing workers on family farms or enterprises, and this phase is also consistent with relatively high fertility rates and low educational levels for women. Self and Grabowski [20], in their research, have shown that female education has the potential to increase economic growth, as compared with male education.

As the economy expands, women reenter the labor force due to higher educational levels, reduction in the fertility rate, and diversified and better employment opportunities, including socially acceptable, service-sector jobs.

Bloom, *et al* [2] find that there is little reason for alarm in most developing countries due to an array of factors, i.e., greater female participation in the labor force, lower youth dependency burden, and increased saving in anticipation of retirement. The rise of the new techno-economic paradigm has been a milestone for the global economy, with digitalization touching almost every aspect of the economy. Digitalization impacts the labor market and the techno-efficiency of the working-age population. Digitalization can have a great impact on the young population of a country to be technologically more up to date, competent, and geared to cope with the changing digital world [18].

Myovella, *et al* [13] investigated the influence of digitalization on economic growth and found that digitalization made a great contribution in up surging economic growth. Habibi and Zabardast [8] documented that education could be one of the reasons why most developing countries were not getting the full benefit of the technological progress. In the coming years, the existing tech-savvy generation and young labor force of emerging nations (i.e., those classified as 'low-income' and 'lower-middle income' nations) may play a vital role in supporting the digitalization process and inclusion, thereby leading to the realization of a digital economy [24].

Objectives, Subject, and Research Scope

The estimation of population aging for Pakistan is to strengthen our understanding of the linkages between population dynamics and economic development, and their macroeconomic implications for the country. The overall objective of this study is to quantify the impact of changes in the population's age structure on economic growth in Pakistan and then propose policies to make use of the "demographic window of opportunity" for economic growth and development in future. To pursue the aforementioned general objective, this study will accomplish specific objectives of:

- assessing the impact of population aging on national income;
- exploring the impact of digitalization on national income;
- assessing the impact of capital formation on national income;
- examining the impact of female labor force participation on national income; and
- using estimates as evidence for proposing policies to take advantage of and translate the "demographic window of opportunity" into a "demographic dividend".

Subjects and Research Scope

Subjects of the study were the entire Pakistani population (disaggregated into age/age groups, genders, and regions) and macroeconomic indicators such as GDP, number of the employed, capital formation, and digitalization. The research uses time series data from 1990 to 2020 to forecast the trends and prospects of economic growth due to the aging population and draw future policy suggestions for the aging population of Pakistan.

Data and Methodology

This study explores the impact of the aging population on economic growth in Pakistan using annual time series data for the period 1990 to 2020. Data for this study was collected from various sources, including the World Bank and the International Labour Organization (ILO). The description of the data series used in this study is given in Table 4. Economic growth is measured by GDP (constant 2010 million USD) while total employment, capital formation, and digitalization index are used as control variables along with the main variable of interest, i.e., the aging population.

TABLE 4

DEPICTION OF THE DATA SERIES.

Variables	Explanation	Unit	Data source
GDP	Real gross domestic product	Constant 2010 million USD	World Bank (2021)
K	Gross capital formation	Constant 2010 million USD	World Bank (2021)
L	Total employment	Employment per 1,000 persons	International Labor Organization (2021)
AG	Population ages 65 and above, total		World Bank (2021)
DI	Digitalization Index (DI) comprises the following components:	Index	World Bank (2021)
	Mobile cellular subscription;	Per 100 people	
	fixed broadband subscription;	Per 100 people	
	fixed telephone subscription;	Per 100 people	
	and internet users.	Per 100 people	

Sources: The World Bank [22]; ILO [9].

First, the researchers calculated descriptive statistics for each data series to determine its fundamental properties. Second, to discover the non-stationarity issue in the data, they used the unit root test, which included the Augmented Dickey Fuller (ADF) test [3]. Third, the researchers used two kinds of co-integration tests to investigate the association between the GDP and the aging population, i.e., the Johansen cointegration test [6] and the ARDL F-bound technique [15].

To begin with, the unit root test was used to find a unit root or non-stationary issue in the dataset. The term "spurious/false regression" refers to regression with unit root in the data, and the assumptions would be fallacious [5]. With the following specification, the non-stationary issue may be easily spotted in a simple AR (1) model:

$$X_t = \Upsilon X_{t-1} + e_t \ (1)$$

The term $\Upsilon < 1$ indicates that the data is stationary, $\Upsilon > 1$ illustrates that the data is explosive, and $\Upsilon = 1$ shows that the data has a non-stationarity issue. The ADF test [3] was employed to seek stationarity in each data series in this research. The ADF test uses equation with constant specification, i.e.,

$$\Delta X = b_0 + \Upsilon_1 X_{t-1} + \sum_{i=1}^{p} \Pi_i \Delta X_{t-i} + e_t \ (2),$$

where b_o, Y_1 and Π are parameters; the residual term at time t is denoted by e_t; and the summation i represents the length of lags in the model and ranges from 1 to p. Based on the model selection criteria, the appropriate lag duration was chosen. The optimum lag length in the model was calculated by applying the Akaike Information Criteria (AIC) in the research.

Furthermore, the Johansen cointegration test was employed to determine the cointegration between the GDP and the aging population in the study. The Trace (J Trace) and Max eigenvalue (J Max) subtests constitute the Johansen cointegration test [6]. Following are the equations for the two subtests:

$$J_{Trace}(k) = -T \sum_{p=k+1}^{n} ln\,(1 - \lambda_p)\ (3);\ \text{and}$$

$$J_{Max}(k+1) = -Tln(1 - \lambda_{k+1})\ (4);$$

Where T denotes the sample size and λ represents the calculated value for the p^{th} order. The eigenvalue is calculated from the matrix π, and the number of cointegration vectors is indicated by k. The J_{Trace} test (k) is employed to check both the null and alternative hypothesis, i.e., H_0: rank $\pi \leq k$ in the contradiction of H_1: rank $\pi > k$. The J_{Max} test (k+1) is applied to assess the hypothesis H_0: rank $\pi \leq k$ against H_1: rank $\pi = k$+1 [7].

Moreover, the study employed the autoregressive distributed lag (ARDL) model [15] to identify the short- and long-term influences of the aging population on real GDP for Pakistan. This method was selected because it takes into account both the short- and long-term effects of the aging population on national production. Besides, this method ensures the model's dynamic stability. The ARDL model specification utilized in this study is as follows:

$$\Delta LnGDP_t = \omega_0 + \sum_{i=1}^{a} \omega_{1i}\, \Delta LnGDP_{t-i} + \sum_{j=0}^{b} \omega_{2j} \Delta LnK_{t-j} + \sum_{k=0}^{c} \omega_{3k}\, \Delta LnL_{t-k} +$$

$$\sum_{l=0}^{d} \omega_{4l}\, \Delta Ln\, AG_{t-l} + \sum_{m=0}^{e} \omega_{5m}\, \Delta LnDI_{t-m} + \alpha_1 LnGDP_{t-1} + \alpha_2 LnK_{t-1} + \alpha_3 LnL_{t-1} + \alpha_4 LnAG_{t-1} +$$

$$\alpha_5 LnDI_{t-1} - \Pi e_{t-1} + e_t\ (5),$$

where Δ symbolizes difference operator; ω and α are corresponding parameters, and e represents error term with a constant variance and zero mean.

Results and Discussion

The core objective of this study was to explore the relationship between the aging population and real GDP in Pakistan using time series data for the period 1990 to 2020. The descriptive statistics of the data series utilized in the study are displayed in Table 5. These statistics describe the essential properties, i.e., mean, median, maximum, minimum, and standard deviations, of each data series individually. The average value of GDP used as a proxy for economic growth is USD158,150.6 million (constant 2010), ranging from USD83,347.04 million to USD258,078.00 million with a standard deviation of USD55, 010.55 million (the World Development Indicators). Also, the mean value of the population aged 65 and above is 6,795,516, with ranges from 4,335,738 to 9,605,834 with a standard deviation of 1,629,611.

TABLE 5

DESCRIPTIVE STATISTICS OF THE DATA SERIES.

Variables	GDP	K	L	AG	DI
Mean	158,150.6	26,187.64	50,366.41	6,795,516	1.652592
Median	154,610.3	25,854.48	49,601.89	6,678,130	0.847135
Maximum	258,078.0	42,274.37	70,915.72	9,605,834	4.379215
Minimum	833,47.04	16,958.94	31,674.52	4,335,738	0.028167
Standard deviation	55,010.55	6,942.429	12,791.47	1,629,611	1.708666

Source: The World Bank [22]; ILO [9].

Largely, nonstationarity and unit root problems exist in case of majority of time series data. We cannot depend on the results of data having a unit root issue since it produces false regression [5]. First of all, the nonstationary issue was explored using the ADF test [3]. Table 6 shows the results of the ADF test. According to these results, the dependent and independent variables are stationary at first difference I (1).

TABLE 6

FINDINGS OF THE AUGMENTED DICKEY–FULLER TEST.

Variables	Test equation	*t* stat.	*P* value	Lags	Conclusion
LnGDP	Constant	−0.74	0.82	(1)	I(1)
Δ***LnGDP***		−3.34**	< 0.05	(1)	
LnK	Constant	−0.96	0.75	(1)	I(1)
Δ***LnK***		−4.09*	< 0.01	(1)	
LnL	Constant	−2.06	0.26	(1)	I(1)
Δ***LnL***		−2.91**	< 0.05	(1)	
LnAG	Constant	−1.17	0.67	(1)	I(1)
Δ***LnAG***			<	(1)	
LnDI	Constant	−1.23	0.64	(1)	I(1)
Δ***LnDI***		−2.97**	< 0.05	(1)	

Note: * and ** show 1% and 5% statistical levels of significance, respectively.
Source: Author's calculations.

Second, the Johansen cointegration test [6] was used to investigate the long-run connection between the real GDP and its key determinants. Table 7 displays the results of the Johansen cointegration test. The findings of both the subtests, J_{Trace} and J_{Max}, show that there is a single cointegrating vector. This implies the existence of cointegration between the aging population and the real GDP.

TABLE 7

RESULTS OF JOHANSEN COINTEGRATION TEST.

Rank test (trace)						
Null hypothesis	Alternative hypothesis	Eigenvalue	Trace statistic	5% critical value	Prob.	Cointegrating equations
H_0: k=0	H_1: k=1	0.87	102.99	69.82	< 0.01	None *
H_0: k=1	H_1: k=2	0.58	44.28	47.86	0.10	At most 1

(Continued on next page)

(Continued from previous page)

Rank test (trace)						
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Trace statistic**	**5% critical value**	**Prob.**	**Cointegrating equations**
H_0: k=2	H_1: k=3	0.38	20.00	29.79	0.42	At most 2
H_0: k=3	H_1: k=4	0.13	6.49	15.49	0.64	At most 3
H_0: k=4	H_1: k=5	0.09	2.56	3.84	0.11	At most 4
Rank test (maximum eigenvalue)						
Null hypothesis	**Alternative hypothesis**	**Eigenvalue**	**Max-Eigen statistic**	**5% critical value**	**Prob.**	**Cointegrating equations**
H_0: k=0	H_1: k=1	0.877165	58.71	33.88	< 0.01	None *
H_0: k=1	H_1: k=2	0.579897	24.28	27.58	0.12	At most 1
H_0: k=2	H_1: k=3	0.382728	13.51	21.13	0.41	At most 2
H_0: k=3	H_1: k=4	0.131068	3.93	14.26	0.87	At most 3
H_0: k=4	H_1: k=5	0.087309	2.56	3.84	0.11	At most 4

Note: * shows 1% statistical level of significance; ** shows 5% statistical level of significance.
Source: Author's calculations.

Additionally, this study examined the cointegration between the aging population and the real GDP using the F-bound test. Results of the F-bound test are given in Table 8. The value of F-bound is significant at 5% as the F-statistical value is greater than the threshold value upper-bound at 5% (5.02 > 4.57), which confirms the acceptance of H_1 hypothesis of cointegration [15].

TABLE 8

RESULTS OF THE F-BOUND TEST.

F-bound test			
F-statistic	5.02**	K	4
Significance level		L_0 (lower bound critical value)	L_1 (upper bound critical value)
10%		3.03	4.06
5%		3.47	4.57
2.5%		3.89	5.07
1%		4.4	5.72

Note: ** shows 5% statistical level of significance.
Source: Author's calculations.

Finally, this study applied the ARDL model to explore short-run and long-run impact of aging population and other factors affecting the national income. Table 9 presents results of the ARDL model. Findings of the ARDL model reveal that the aging population negatively and insignificantly affects the national income both in short and long runs. In addition, capital formation also positively and significantly impacts the national income both in short and long runs. However, labor measured in terms of total employment appears statistically significant in the short run only, while

digitalization has a positive and significant impact on the national income in the long run only. These findings imply that capital formation and digitalizing the economy play significant roles in determining the national income of Pakistan. On the other hand, the aging population is decreasing the national income insignificantly. This implies that aging population is not a serious issue in the short run but can be a potential issue in the long run. The policy makers and Government of Pakistan should consider digitalizing and amplifying the role of capital in the national income to compensate for the adverse effect of aging population in the long run.

The value of the ECT coefficient shows an adjustment of 104% per year. Moreover, the short-term imbalance in the ARDL model will automatically reach the long-run equilibrium in 0.96 years.

In sum, the aging population, as per the economic theory, appears to affect the real GDP negatively. However, its impact is statistically insignificant. It implies that in the short run, the aging population is not a considerable issue for Pakistan's economy, which also gets support from the ground reality that most of its population comprises young people. However, it may appear to be a potential issue in the long run. The digitalization index, on the other hand, comes up with a positive and statistically significant impact on the real national income, given the control of the aging population. Also, capital formation has a positive and significant influence on the national income both in the short run and the long run. These findings entail that with an increased level of digitalization in the economy and by augmenting the role of capital in the production of national income, the impact of aging population on economic growth can be compensated.

TABLE 9

RESULTS OF THE ARDL MODEL.

Variables	Short-run elasticities	Standard error	t-statistic	Prob.
ΔLnK_t	0.25*	0.04	6.04	0.0000
ΔLnL_t	0.35***	0.20	1.76	0.0921
$\Delta LnAG_t$	−0.92	1.45	−0.63	0.5330
$\Delta LnDI_t$	0.003	0.02	0.22	0.8302
ECT_{t-1}	−1.04*	0.16	−6.34	0.0000
Long-run elasticities				
LnK_t	0.24*	0.02	10.48	0.0000
LnL_t	0.34	0.20	1.68	0.1078
$LnAG_t$	−0.49	0.38	−1.29	0.2087
$LnDI_t$	0.01***	0.01	1.75	0.0949
Constant	12.87**	4.56	2.82	0.01
R-squared	0.87	Adjusted R-squared		0.73
AIC	−6.25	SBC		−5.53
HQ	−6.03	Log likelihood		102.50
ARDL specification	(1, 0, 0, 1, 1)			

Note: *, **, and *** signify 1%, 5%, and 10% statistical level of significance, respectively.
Source: Author's calculations.

Existing Policies and Future Policy Suggestions

In the short run, aging population in Pakistan does not have considerable issue in the presence of a young population, low fertility rate, and a lower dependency ratio. In the long run, due to the variation of these factors, aging population can adversely affect the national income. In addition to current socioeconomic policies, there is a need for sustainable human development policies and programs to turn this demographic dividend into opportunities. The characteristic of demographic dividend shows a need to develop long-term policies for enhancing the skills and capabilities of the educated youth. To reap the potential benefits of the demographic dividend, it is imperative that the young are provided with gainful employment opportunities. From a future policy perspective, as these young workers progress, they not only provide for their own living but also for those who are dependent on them. Large-scale holistically designed programs, keeping in view the low literacy rate among females, are needed to encourage the idea of small family sizes and lower fertility rates on a voluntary basis.

Due to underdeveloped and uneven internet infrastructure, continuous efforts toward digitalization, both by public and private sectors, bring a small effect on economic growth. A transformation into digitalization can achieve its best results if it is utilized as a tool to train and educate the young population of Pakistan. The Pakistani society has already achieved a good mobile penetration rate. The use of digital media, especially in higher education, is on the rise and the demand for digitized content is growing increasingly. A substantial investment by Government of Pakistan in digital transformation is highly recommended.

An increased share of working-age population has substantial impact on individual as well as aggregate consumption, saving, and employment. The aggregate saving could lead to increased capital formation and an increase in the economic growth. Policy measures should encourage continuous increase in saving rates through labor market efficiency, to increase labor force participation rate and to create old-age friendly employment environment. Policy measures that encourage research and development (R&D) to promote innovation and technological progress may be the most useful and viable ways to mitigate the adverse effect of population aging on economic growth. Moreover, increasing human capital formation is also an important policy measure because it improves labor quality and productivity, so that the adverse "volume" effect of population aging on labor force can be partially offset by the improvement in labor productivity.

References

[1] Bloom D.E., Royan R., Sathar Z. "Preface." Capturing the Demographic Dividend in Pakistan. New York: The Population Council; 2013.

[2] Bloom D.E., Canning D., Finlay J.E. Population aging and economic growth in Asia. In: Ito T., Rose A. eds. The economic consequences of demographic change in east Asia. NBER-EASE 2010; vol. 19, pp. 61–89. Chicago, IL: University of Chicago Press.

[3] Dickey D., Fuller W. Likelihood ratio statistics for autoregressive time series with a unit root. Journal of Econometric Analysis 1981; 49(4): 1,057–1,072.

[4] Goujan A., Wazir A., Gailey N. Pakistan: A population giant falling behind in its demographic transition. Population and Societies 2020; 576(4): 1–4.

[5] Granger C.W.J., Newbold P. Spurious regressions in econometrics. Journal of Economics 1974; l(2): 111–120.

[6] Johansen S., Juselius K. Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. Oxford Bulletin of Economics and Statistics 1990; 52(2): 169–210.

[7] Kočenda E., Černý A. (2015). Elements of time series econometrics: An applied approach. Charles University in Prague, Karolinum Press.

[8] Habibi F. Zabardast M. A. (2020). Digitalization, education and economic growth: a comparative analysis of Middle East and OECD countries. Technol. Soc. 63, 101370. https://doi.org/10.1016/j.techsoc.2020.101370.

[9] International Labor Organization (2021) Statistics of Labour Force, Employment, Unemployment and Underemployment. Report Prepared for the Thirteenth International Conference of Labour Statisticians (Geneva, 18–29 October 2021).

[10] ITU. Measuring Digital Development – Facts and Figures 2021, International Telecommunication Union, Development Sector, Switzerland; 2021.

[11] LFS (2018–19) Pakistan Labor Force Survey, Pakistan Bureau of Statistics, Government of Pakistan

[12] Liu S., Hu A. Demographic change and economic growth: theory and evidence from China. Economic Modelling 2013; 35: 71–77. https://doi.org/10.1016/j. econmod.2013.06.041.

[13] Myovella G., Karacuka M., Haucap J. (2020). Digitalization and economic growth: a comparative analysis of Sub-Saharan Africa and OECD economies. Telecommunication Policy, 44, 101856. https://doi.org/10.1016/j.telpol.2019.101856.

[14] Kelly A C., Schmidt R M. Evolution of recent economic-demographic modeling: A synthesis. Journal of Population Economics 2005; 18: 275–300.

[15] Pesaran M H., Shin Y., Smith R.J. Bounds testing approaches to the analysis of level relationships. Journal of Applied Economics 2001; 16(3): 289–326.

[16] PBS (2017). Provisional summary results of 6th Population and Housing Census, Pakistan Bureau of Statistics, Islamabad, Islamic Republic of Pakistan.

[17] Sathar Z., Kamran I., Sadiq M., et al. Youth in Pakistan: Priorities, realities and policy responses. Islamabad: Population Council; 2016.

[18] Sahoo D., Nayak S., Behera J. (2021). Digitalization and Economic Performance of Two Fast Growing. Asian Development Bank Institute.

[19] Schultz T. (2002). Why governments should invest more to educate girls. World Development, 30 (2), pp. 207–225.

[20] Self A., Grabowski R. Does education at all levels cause growth? India, a case study. Economics of Education Review 2004; 23: 47–55.

[21] UN (2020). World population prospects 1950–2050: The 2020 revision, New York, United Nations Population Division, https:// population.un.org/wpp2020/

[22] World Bank (2021) Data Bank: World Development Indicators.

[23] Lee R., Mason A. What is a demographic dividend? Finance and Development 2006; 43(3).

[24] Zaman K.A.U., Sarker T. (2021). Demographic Dividend, Digital Innovation, and Economic Growth: Bangladesh Experience, ADBI Working Paper Series. https://doi. org/10.1007/978-1-349-67278-3_116.

VIETNAM

Abstract

As a middle-income country, Vietnam has experienced an aging population since 2015 and is expected to become a rapidly aging country in the coming decades. As such, maintaining and improving productivity, and thus the economic growth, is an important policy consideration. To do so, the situation and factors associated with productive work should be thoroughly explored.

Using data from the Labor Force Survey for the 2010–20 period, this research explored the situation of productive work in Vietnam. It showed that the number of productive work increased by around 1.5 times (from 14 million to 20.5 million) during the period, but the proportion in the total labor force slightly decreased from 85.9% to 78.9% of the labor force. The research also found that those aged 30–44 years and 45–59 years had increasing proportions of productive work, which was an important opportunity for Vietnam to realize a "demographic dividend" through these workers.

Applying Heckman two-step probit regressions, the research found that female workers, rural workers, workers with lower educational levels, those working for domestic private enterprises, and workers in agricultural sector had lower probabilities to have productive work than their respective counterparts.

Based on these findings, the research suggested grasping the "demographic window of opportunity," along with preparing for "demographic aging" with adaptive policies and strategies on economic structure, education, and health.

Introduction

Rationale

Aging population is a great celebration as well as a great challenge for socioeconomic development and health protection [24]. In recent years, a number of studies have quantified the impact of demographic structural changes on economic growth. Lee and Mason [15] and An and Jeon [1], for instance, show that when a population is in a "demographic window of opportunity" period (i.e., the working-age population is double the non-working-age population), the labor force will positively influence economic growth, and as such a "demographic dividend" can be achieved. On the contrary, when the population is aging, the labor force and savings will be reduced and thus there will be a negative impact on economic growth. Such a negative impact of population aging on growth is also indicated clearly in various studies, such as those by Bloom and Williamsons [3] and Faruqee and Mühleisen [5].

The growth of working-age population is a great opportunity for economic growth. Beaudry and Collard [2] argue that a country might not be able to take advantage of a demographic window of opportunity for its economic growth if it fails to make effective use of its potential labor force. They estimate the impact of the working-age population on some key macroeconomic indicators (such as GDP per adult population, GDP per employed population, and employment rate) in 18 richest industrialized countries during 1960–97. Findings from the growth regression models in the

two periods of 1960–74 and 1975–97 indicate that countries with different adult population growth rates did not differ in the mentioned macroeconomic indicators during 1960–74, but clearly differed during 1975–97. The countries with lower adult population growth had higher GDP/employed population growth rates, lower employment rates of adult people, and GDP/adult population ratios similar to countries with higher rates of adult population growth.

Kelley and Schmidt [13] have studied the impact of population's age structural changes on economic growth in various countries, using different demographic variables (such as the youth dependency ratio, old-age dependency ratio, population size, and population density) as determinants of per-capita income growth. With data from 86 countries divided into four phases during 1960–95, the results show that the growth of the working-age population had a positive influence on economic growth and that economic growth was higher if the growth rate of the working-age population was higher than that of the total population. The study emphasized that the reduction of dependency ratios (most importantly, the youth dependency ratio) had a positive impact on economic growth, while the growth of total population had a negative impact. Similarly, Bloom and Williamson [3] calculated the contribution of the population's age structure to the miracle growth in east Asia during 1965–90. The results indicated that the growth of the working-age population was 0.8 percentage point higher than the growth of total population (2.4% versus 1.6%) and that this was an important factor contributing to economic growth. Changes in population age structure contributed from 1.4 to 1.9 percentage points to per-capita GDP growth of 6.11%, or from 23%, i.e., $\frac{1.4}{6.11}$ to 31%, i.e., $\frac{1.9}{6.11}$. The authors highlight that the policy environment and economic and political organizations in the economy play important roles in translating a "demographic window of opportunity" into a "demographic dividend." Prskawetz and Lindh [21] show that east Asian countries achieved growth rates 40% higher than those in Latin America since they had higher rates of working-age population growth and better economic policies.

In addition to the aforementioned studies, there are also a number of studies, such as An and Jeon [1] for the Republic of Korea and Liao [14] for the Republic of China, showing that changes in population's age structure contributed more than a third of per-capita GDP growth in these economies.

Over the past four decades, Vietnam has experienced significant changes in fertility rates, mortality rates, and life expectancy. The total fertility rate (TFR) declined from 4.81 in 1979 to 2.33 in 1999, and subsequently to 1.99 in 2009 and slightly up to 2.09 in 2019, which was around the replacement rate. At the same time, life expectancies at birth for both Vietnamese men and women improved and reached 73.6 years in 2019, in which the average life expectancy for men and women were 71.0 years and 76.3 years, respectively [10]. Various studies, such as UNFPA [23] and GSO, *et al* [10] show that Vietnam's population is reaching the end of "demographic transition" with two important demographic trends at the same time, i.e., "demographic window of opportunity" until 2039 and "demographic aging" until 2036, and then "demographic aged."

A crucial policy concern for Vietnam is to grasp the "demographic dividend" and prepare for "demographic aged" in such a short time. In recent years, some studies have sought answers to these questions by using different approaches. For instance, Tran Tho Dat and Do Tuyet Nhung [22], using the provincial data for the period 2000–04, applied a neoclassical growth model with a Cobb–Douglas production function, and found that education really contributed to provincial economic growth and that per-capita GDP was higher in the provinces with higher human capital

levels. Also, using the provincial data for the period 2002–06, Nguyen Thi Minh [17] showed that changes in age structure contributed approximately 14.5% to per-capita GDP growth in the sampled provinces. Research by Nguyen Dinh Cu and Ha Tuan Anh [16] also proved that, during 1999–2009, changes in age structure contributed up to 2.29 percentage points in 6% economic growth (equivalent to 38% of the growth). Moreover, their projections for the 2009–59 period indicate that this positive impact will diminish at first and then even have a negative impact when the population begins to age rapidly.

Applying National Transfer Accounts (NTA) approach with data from Vietnam Household Living Standard Survey (VHLSS), Giang Thanh Long and Pham Ngoc Toan [6], Bui Thi Minh Tiep [4], and Nguyen Thi Lan Huong, *et al* [18] show that the economic growth of Vietnam in the coming decades with a rapidly aging population will slow down if labor productivity is kept the same as now, and that improving labor productivity will be the key to sustain economic growth for an aged population in the middle of this century.

Given the above rationale, this research aims to explore the situation and factors associated with the productive work in Vietnam in order to discuss policy implications in taking advantage of the "demographic window of opportunity" so as to be adaptive and well-prepared for a rapidly aging population in the coming decades.

Research Objectives and Scope

Research Objectives

The general objective of this research was to explore the situation and factors associated with productive work in Vietnam in order to provide various policy implications for economic growth in an expected rapidly aging population in the coming decades.

The specific objectives of this research were to answer the following research questions:

(1) How is the situation of aging population in Vietnam?

(2) How has been the situation of productive work in Vietnam, and what have been the factors associated with such a situation?

(3) What are policy implications for Vietnam under an expected aging population?

Research Scope

To answer the above research questions, the time frame for demographic analysis was from 2009 to 2069, while that for the productive work was from 2010 to 2020.

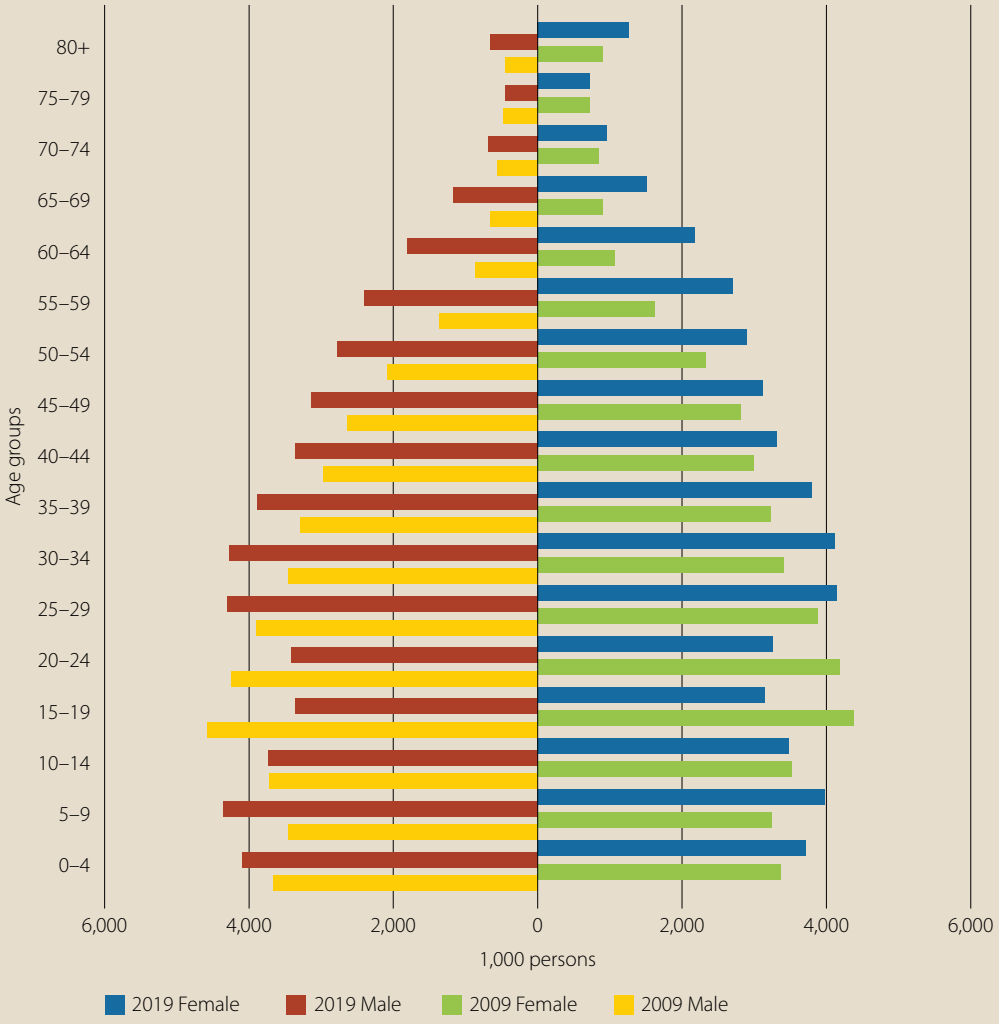
Demographic Aging in Vietnam

Data from the Population and Housing Censuses in 2009 and 2019 showed that the total population of Vietnam on 1 April 2009 was 85.85 million, while on 1 April 2019 it was 96.21 million. Also, the old-age population (defined as those aged 60 and above) in 2009 was 7.45 million (8.68% of the total population), while in 2019 it was 11.41 million (11.86% of the total population). During this ten-year period of 2009–19, the average annual growth rate of total population was 1.14%, while that of old-age population was 4.35% [10]. Figure 1 presents the population pyramids for 2009 and 2019.

The population projections under the assumption of medium fertility rates for the period 2009–2069 by GSO [9] show that the old-age population will reach 17.28 million (16.53% of the total population) in 2029; 28.61 million (24.88% of the total population) in 2049; and 31.69 million (27.11% of the total population) in 2069. If older persons are defined as those aged 65 and above, then projections show that the old-age population will reach 12.03 million (11.51% of the total population) in 2029; 21.09 million (18.34% of the total population) in 2049; and 25.16 million (21.52% of the total population) in 2069. Such projections imply that the Vietnamese population will be an "aged population" (when those aged 65 and above account for 14% of the total population) in 2036, and the number of old-age persons will be 15.46 million (see Figure 2). With the definition of the UN for a country to be in a "demographic window" period (i.e., when the share of population under 15 years of age falls below 30% and the share of people aged 65 years and older is still below 15% of the total population), the projections indicate that Vietnam's "demographic window" will end by 2039.

FIGURE 1

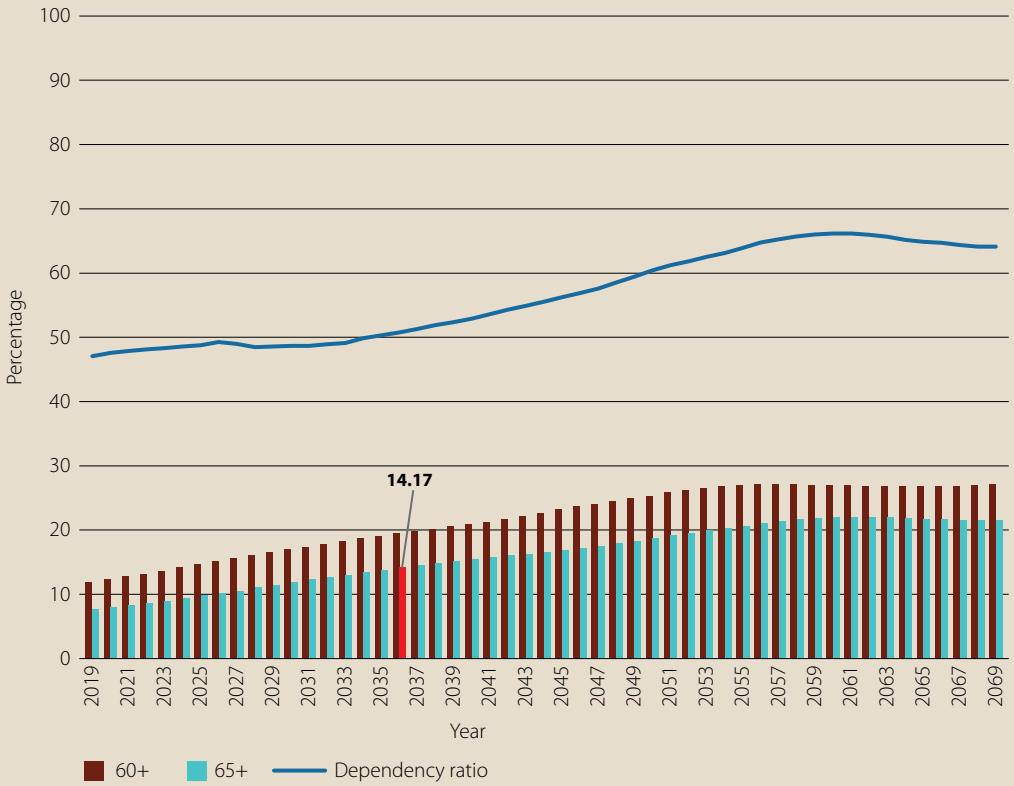
VIETNAM'S POPULATION PYRAMIDS IN 2009 AND 2019.



Source: GSO, *et al* [10], using data from PHCs 2009 and 2019.

FIGURE 2

PROJECTIONS FOR SHARES OF POPULATION AGED 60+, 65+, AND THE DEPENDENCY RATIO, 2019–69.



Source: GSO [9].

Data and Methodology

Data

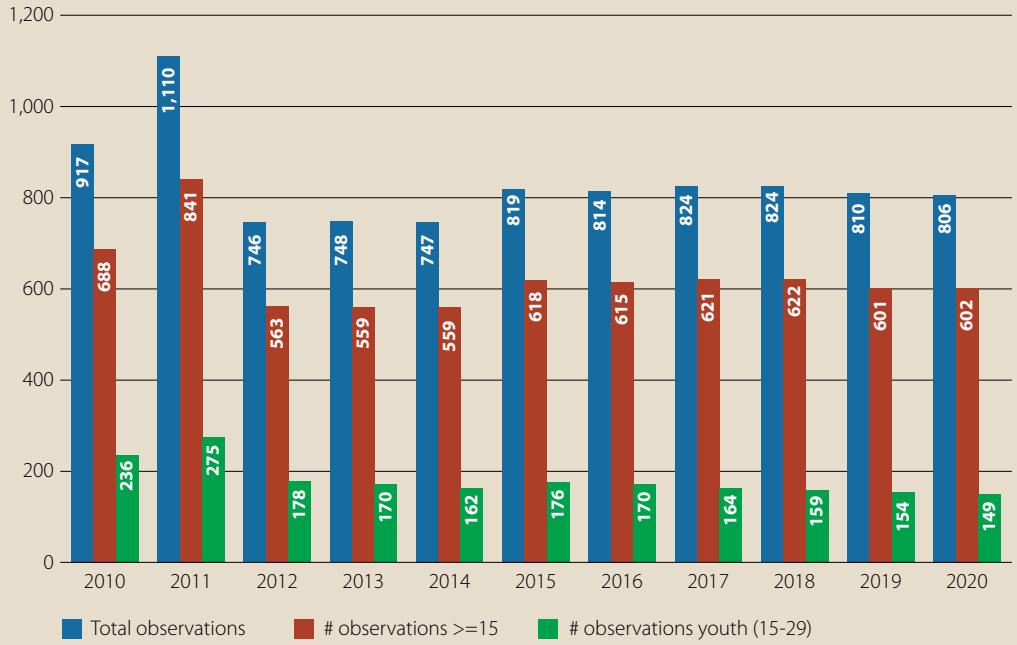
The Labor Force Survey (LFS) for the period 2010–20 is explored in this research. Since 2007, the LFS has been implemented by the Vietnam's General Statistics Office (GSO) [8].

The LFS is a sampling survey in the national statistical survey program conducted for the purpose of collecting information on the labor market participation status of people aged 15 years and older currently living in Vietnam. It serves as a basis for synthesizing and compiling national statistical indicators on labor, employment, unemployment, and income (wages) of workers. The survey results help all levels and sectors to assess and forecast the fluctuation of the labor market nationwide, and to develop and plan human resource development policies, production, and business plans consistent with the development trend of the labor market.

The LFS has been conducted monthly and provided quarterly since 2011. This survey is conducted in accordance with the International Labour Organization (ILO) standards and can be used to assess the dynamics of the labor market by quarter. The LFS sampling frame from 2009 to 2018 was based on 15% sample of the 2009 Population and Housing Census, while LFS 2019 and 2020 were based on 100% sample of the 2019 Population and Housing Census. The total number of observations, total number of population aged 15 years and above, and total number of youth aged 15–29 years (as defined by the Youth Law of Vietnam) are shown in Figure 3.

FIGURE 3

NUMBER OF OBSERVATIONS IN THE LFS, 2010–20.



Source: Author's own compilations, using LFS 2010–20.

Regarding information on employee's income, data for the period 2010–14 only had information on incomes of waged workers, and thus it only reflected the income data for about 35–40% of the employed people. However, from 2015 onwards, income information was collected for all surveyed people aged 15 years and above. Information on wages is important for assessing the quality of those employed in the labor market. However, due to inconsistency in data during the 2010–20 as indicated, this research has used data for waged workers only.

Methodology

Definition and Measurement of Productive Work

"Productive employment is defined as employment yielding sufficient returns to labor to permit the worker and her/his dependents a level of consumption above the poverty line" [12]. In Vietnam, the minimum wage is defined as "the lowest salary paid to workers who perform the simplest jobs under normal working conditions in order to ensure a minimum standard of living for workers and their families, suitable to the conditions of socioeconomic development," as per Clause 1, Article 91 of the Labor Code 2019.

In comparison with the minimum wage applied to waged workers in enterprises, the income threshold for productive employment as defined by the ILO is lower. This can be explained by two basic reasons. First, the ILO definition of productive employment is based on the poverty line, which is quite low as set by the MOLISA. Second, the ILO definition of productive employment applies to all waged workers (both formal and informal), while the minimum wage requirement is applicable only to formal workers in Vietnam. Therefore, we will use the minimum wage threshold of Vietnam's region 1 (the highest threshold) to calculate productive employment in this research.[1]

[1] Currently, Vietnam is divided into four minimum-wage regions, of which region 1 is the most developed (e.g., cities, districts, and districts of centrally run cities), while region 4 is the least developed.

In other words, in this research, productive workers are defined as those having income greater than or equal to the minimum wage of region 1.

Econometric Modelling

The estimated sample only includes waged workers, so there is a problem of selection bias between waged and non-waged workers because some characteristics of non-waged workers are not observed in the model. Therefore, we have applied Heckman's method [11] to correct this phenomenon. The Heckman model, first introduced in 1976, is used to overcome the problem of sample selection bias, which occurs when data for a variable in the model are missing in some cases and those missing data represent other factors.

For simplicity, we consider only the Heckman model with one independent variable as follows:

$$Y_1 = \beta_0 + \beta_1 X + \delta\varepsilon \qquad (1),$$

where X is the independent variable, Y_1 is the dependent variable, and $\delta\varepsilon$ is the noise error of the regression (in which ε is assumed to follow the normal distribution with mean 0 and variance 1).

With similar data for equation (1), we define the selection equation as

$$Y_2 = \alpha Z + \delta \qquad (2),$$

where δ follows the normal distribution with mean 0 and variance 1, Z is the independent variable in the selection equation, and α is the estimated coefficient of Z.

Let T be a scalar quantity representing the selection threshold. The value of Y_1 is observed only in some cases (selected or uncensored cases) and is missing in other cases (censored cases). The data is selected if $Y_2 > T$ for that case, and the data is censored if $Y_2 \leq T$.

For each particular value of Z, the probability of selection is determined by T, α, and random noise error. The larger the value of α, the more sample choices are selected depending on the value of Z. The larger the value of T, the smaller the probability of selecting observations (regardless of the value of Z). If $\alpha = 0$, the selection is random and merely reduces the sample size. If $T = -\infty$, all cases are selected regardless of how large the value of α is. If $T = +\infty$, no case is selected regardless of how small the value of α is.

Heckman [11] observed that if only selected cases are used for estimating equation (1), then there is a possibility that the estimate is biased. Therefore, Heckman calculated the conditional expectation of Y_1 under the observed condition Y_1 by the formula

$$E(Y_1 | Y_2 > T) = \beta_0 + \beta_1 X + \sigma\rho_{\varepsilon\delta}\lambda(T - \alpha Z) \qquad (3),$$

where $\rho_{\varepsilon\delta}$ is the correlation between ε and λ. Here, λ is the inverse of the Mills ratio function, which is calculated by the following formula:

$$\lambda(T - \alpha Z) = \frac{\varphi(T-\alpha Z)}{[1-\Phi(T-\alpha Z)]} \qquad (4),$$

where $\varphi(T - \alpha Z)$ is the standard probability density function (height of the normal distribution) calculated at $(T - \alpha Z)$ and $\Phi(T - \alpha Z)$ is the normal cumulative distribution function (area under

the normal distribution). Therefore, in the presence of the selection, the original regression equation is no longer relevant because it lacks an independent variable in the equation. This independent variable and its coefficient form an estimate of $\sigma\rho_{\varepsilon\delta}$. If it is indeed correlated with X and Y_1, then instead of estimating

$$Y_1 = \beta_0 + \beta_1 X + \delta\varepsilon \qquad (5),$$

we will estimate

$$Y_1 = \beta_0 + \beta_1 X + \sigma\rho_{\varepsilon\delta}\lambda(T - \alpha Z) + \sigma'\varepsilon' \qquad (6),$$

where ε' has a mean of 0 but is not normally distributed, and σ' is a coefficient and is not necessarily equal to σ.

Heckman [11] has showed that this can be estimated by the estimated values in probability unit analysis (probit) where the independent variable is Z and the dependent variable is a dummy variable (zero if Y_1 has a missing value, and equal to 1 if the value of Y_1 is not missing). Thus, Heckman's two-step correction includes the following:

Step 1: Estimate the probit regression to estimate the value for each observation in the sample and then calculate the inverse Mills ratio from the estimates for each observation in the sample.[2]

Step 2: Regression of the equation $Y_1 = \beta_0 + \beta_1 X + \beta_2 M + \sigma'\varepsilon'$ (7)

with the equation $M = \lambda(T - \alpha Z)$ and $\sigma'\varepsilon'$ is the noise error. That is, use it as an additional independent variable in equation (1) to obtain an estimate of β.

However, the regression in step 2 above is applicable to the ordinary least squares (OLS) linear regression model when the dependent variable is a continuous variable (such as wage). When the dependent variable continues to be a binary variable, step 2 will continue to run the probit model again to get the selection bias correction result.

More specifically, we have applied the model estimation steps, as follows:

Step 1: Run the probit model with the dependent variable receiving two values: 1 if waged worker, and 0 if non-waged worker. The independent variables are the variables of individual characteristics of workers that have an impact on the participation of the waged worker in the labor market. The result of step 1 will get the estimate of the inverse Mills ratio.

Step 2: Run the probit model with the dependent variable taking two values: 1 if there are productive jobs, and 0 if there are non-productive jobs. The independent variables are the individual worker characteristic variables that have an impact on obtaining productive and unproductive jobs and the inverse Mill ratio obtained from the results of step 1.

[2] The inverse Mills ratio, named after John P. Mills, indicates the ratio of the probability density function to the cumulative distribution function of a distribution.

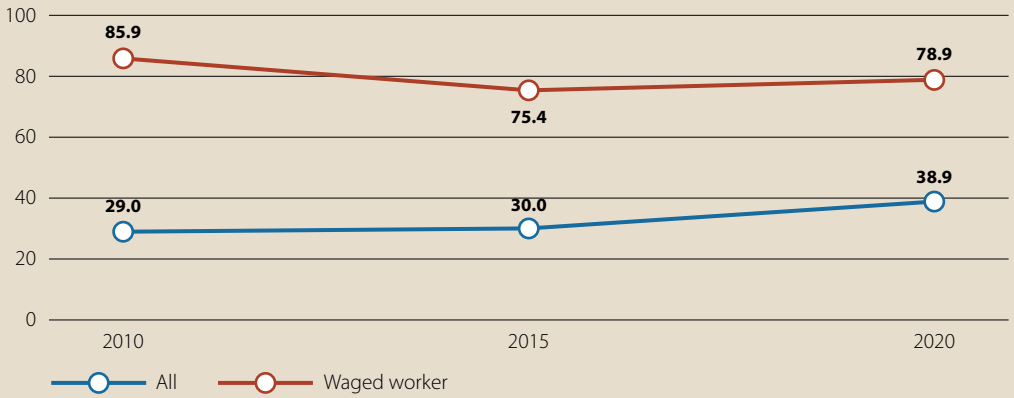
Results

Productive Work in Vietnam, 2010–20

The average rate of productive employment in Vietnam tended to increase in the period 2010–20. Accordingly, this proportion increased from 29% in 2010 to 39% in 2020 (see Figure 4), equivalent to an increase from more than 14 million productive workers in 2010 to 20.5 million workers in 2020.

FIGURE 4

PRODUCTIVE EMPLOYMENT RATE IN %, 2010–20.



Source: Author's own calculations, using LFS 2010, 2015, and 2020.

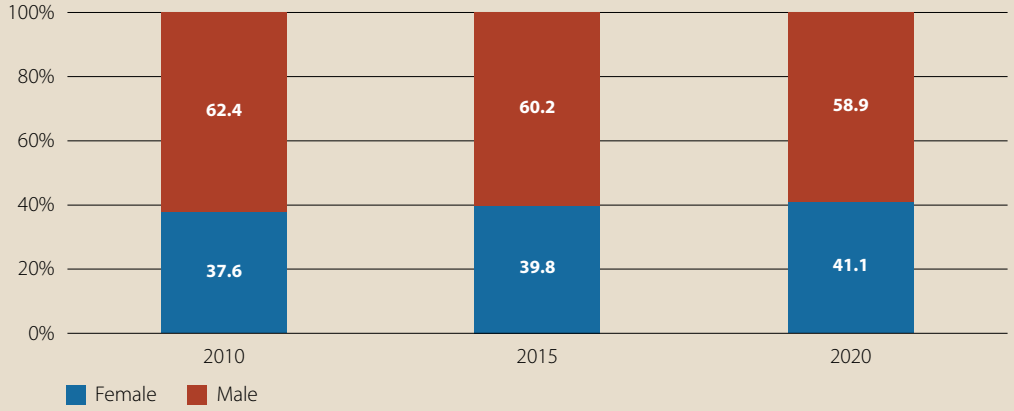
Although the rate was quite high, the productive employment rate among waged workers tended to decrease slightly from 85.9% in 2010 to 78.9% in 2020.

Distribution of Productive Employment by Gender

Although the proportion of male workers in productive employment among total waged workers was higher than that of female workers, the gender gap was narrowed significantly between 2010 and 2020. More specifically, the disparity gap decreased from 24.7 percentage points in 2010 to nearly 17.9 percentage points in 2020 (see Figure 5).

FIGURE 5

PROPORTION OF PRODUCTIVE EMPLOYMENT BY GENDER AMONG WAGED WORKERS, 2010–20.



Source: Author's own calculations, using LFS 2010, 2015, and 2020.

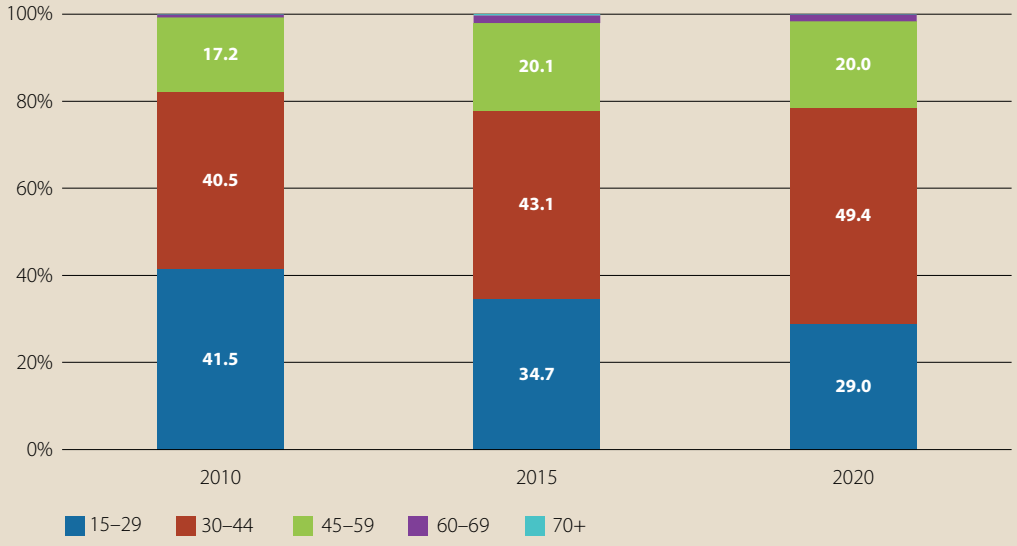
Distribution of Productive Employment by Age Group

By age group, Figure 6A shows that among waged workers, the age groups of 15–29 years and 30–44 years had productive employment rates of 43% and 41%, respectively, in 2010. However, Figure 6B shows that the productive employment rate of the age group 15–29 years decreased significantly by around 30% during 2010–20. In contrast, the proportions of the age groups 30–44 years and 45–59 years increased by 22% and 16.5%, respectively. In particular, the share of productive employment in the 60–69 group spiked 116% over the 10-year period, from 0.7% in 2010 to 1.5% in 2020.

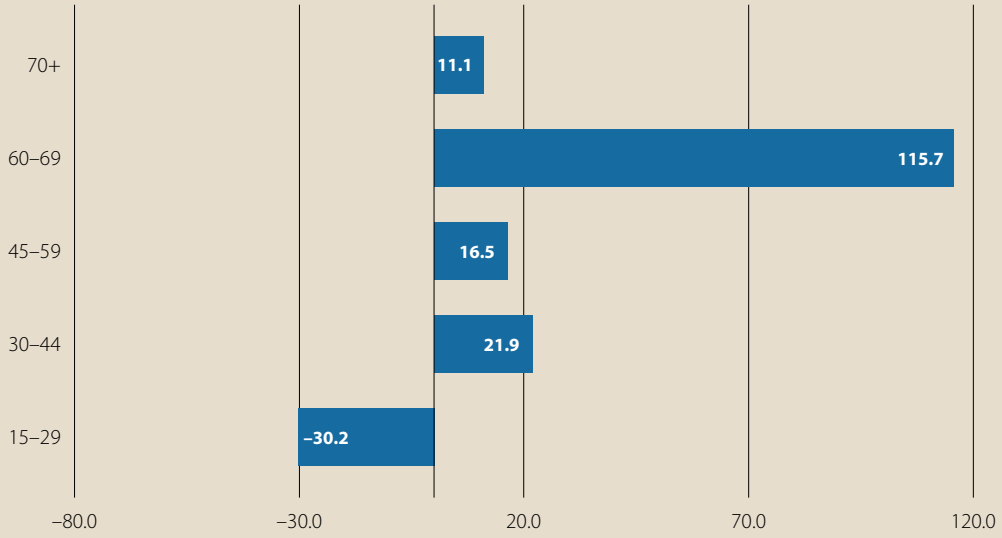
FIGURE 6

SHARES OF PRODUCTIVE EMPLOYMENT BY AGE GROUP AMONG WAGED WORKERS, 2010–20.

A: Proportion of productive employment by age group.



B: Percentage change in productive employment by age group.



Source: Author's calculations, using LFS 2010–20.

Factors Affecting Productive Work in Vietnam

Table 1 reports the marginal-effect results of estimation using Heckman's two-step probit model when the independent variables change from 0 to 1, i.e., the probability changes in terms of percentage points when the independent variable changes compared with its reference group. Accordingly, the estimated values marked with ***, **, and * have statistical significance of 1%, 5%, and 10% significance levels, respectively.

The estimation results show that factors such as age group, gender, education level, informal employment, urban area, and living with a spouse are statistically significant and tend to follow expectations. More specifically, male workers, people living with spouse, and people living in urban areas tended to have more productive work than their counterparts (i.e., female workers, single people, and people living in the rural areas, respectively). Except for 2010, informal employment among waged workers in 2015 and 2020 were less likely to have productive jobs than formal waged workers. This result also reflects the real situation as well as those found in previous studies.

TABLE 1

MARGINAL EFFECTS BY HECKPROBIT MODEL, LFS 2010, 2015, AND 2020.

	2010 pro_emp_mw1	2015 pro_emp_mw1	2020 pro_emp_mw1
Age groups			
15–29 (reference)			
30–44	0.0667***	0.143***	0.0869***
45–59	0.0190***	0.107***	0.0883***
60–69	–0.234***	–0.136***	–0.0200**
70+	–0.340***	–0.255***	–0.113***
Gender			
Female (reference)			
Male	0.132***	0.194***	0.131***
Place of residence			
Rural (reference)			
Urban	0.0230***	0.0460***	0.00530*
Employment types			
Formal employment (reference)			
Informal employment	0.0104***	–0.274***	–0.165***
Marital status			
Non-married (single, etc.) (reference)			
Married	0.0472***	0.0785***	0.0374***
Highest educational level			
Secondary (reference)			
No education	–0.105***	–0.134***	–0.0893***
Primary	–0.0402***	–0.0314***	–0.0237***

(Continued on next page)

(Continued from previous page)

	2010 pro_emp_mw1	2015 pro_emp_mw1	2020 pro_emp_mw1
High school	0.00753*	0.0140***	0.0125***
College	0.104***	0.0571***	0.00127
University or higher	0.164***	0.189***	0.0750***
Business ownership			
Individuals (reference)			
States	0.00837	–0.160***	–0.0801***
FDI	0.171***	0.127***	0.0858***
Domestic enterprises	0.111***	0.0540***	0.0229***
HH business	0.0560***	0.0369***	0.00791*
Northern Uplands	–0.0105**	–0.0661***	–0.0722***
Red River Delta (reference)			
Centre Coast	–0.0531***	–0.0752***	–0.0971***
Central Highlands	0.0363***	–0.0499***	–0.0808***
Southeast	0.0450***	0.0871***	0.0525***
Mekong River Delta	–0.0573***	–0.112***	–0.0798***
Observations	**504,485**	**464,125**	**426,138**

Source: Author's own calculations, using LFS 2010, 2015, and 2020. Significant levels are *** (1%), ** (5%), and * (10%).

The estimated results show that, compared with the youth group (aged 15–29), the increased age helps workers have an increased probability of getting a productive job in the main working age group. However, this probability decreased for those aged 60–69 years, 70 years, and above. For example, the estimates for the year 2020 indicate that, while the age groups 30–44 years and 45–59 years had 8.7 percentage points higher probability of having a productive job than the youth group, the age groups of 60–69 years and 70 years and above had a lower probability by 2 percentage points and 11.3 percentage points, respectively. This result means that if Vietnam's population aging trend increases with an increasing number of people over 60 years old while the probability of this age group having a productive job is lower, it will be a big challenge for Vietnam.

In terms of gender, men had 13.1 percentage points higher probability of having productive work than women when other factors remain unchanged. This result is quite similar to many studies on the wage gap between men and women.

Workers in urban areas have 0.53 percentage points higher probability of getting a productive job than workers in rural areas.

Informal waged workers[3] have 16.5 percentage points lower probability of getting a productive job than formal waged workers. This reflects the fact that informal workers often work in precarious conditions and earn less than formal workers [19].

[3] Informal workers are those who are not part of the social security system.

In terms of the highest qualification level, waged workers with higher qualifications than those who graduated from lower secondary schools have a significantly higher probability of having a productive job, and the higher the qualification, the greater the probability. For example, college and university graduates had 10.4 percentage points and 16.4 percentage points higher probability of having a productive job than secondary school graduates in 2010, while the probabilities in 2020 were 0.13 percentage points and 7.5 percentage points, respectively. In contrast, people with no qualifications or only primary school graduates tend to have less productive jobs than those with lower secondary education. All results are statistically significant at 1% level.

In terms of the form of ownership, laborers working in the FDI sector had 17.1 percentage points higher probability of having a productive job in 2010 and 8.6 percentage points higher probability in 2020 than those working in agricultural-forestry-fishery households. Similarly, workers in domestic private enterprises also had a higher probability of having productive jobs than those working in agricultural-forestry-fishery households in 2010, 2015, and 2020.

In terms of economic regions, Vietnam is divided into six economic regions, of which the two most developed regions are the Red River Delta (with Hanoi as the capital city) and the Southeast region (with Ho Chi Minh City as the economic centre). When taking the Red River Delta as a reference group, the estimated results show that workers in less developed regions such as the Northern Upland, the Central Coast, the Central Highlands, and the Mekong River Delta had higher probability of getting lower productive work. Only workers in the Southeast region (where there are highly developed provinces with large industrial zones such as Ho Chi Minh City, Binh Duong, Dong Nai, and Ba Ria-Vung Tau) had 5.3 percentage points higher probability of having productive jobs than their counterparts in the Red River Delta region.

Discussion and Concluding Remarks

Using national scale survey on labor market during 2010–20, this research explored the situation of productive work in Vietnam. In terms of the number of productive workers, the research found that it increased about 1.5 times (from 14 million to about 20.5 million) in the 2010–20 period. Given the increased labor force, this meant that Vietnam experienced a slight reduction in the proportion of productive workers in this period, from 85.9% to 78.9% of the labor force. Among various factors, such a situation could be explained by the fact that workers have shifted to sectors and jobs with higher productivity (and thus higher wages), but the increase rate of these workers was lower than the increase rate of the labor force. Given the fact that Vietnam will be aging more rapidly in the coming decades, such a situation suggests that Vietnam needs to improve utilization of more productive workers.

The research also found that the share of youths (those aged 15–29 years) among the productive workers has reduced over time. Skill mismatch was one of the key reasons for this situation [6]. This indicates the importance of training programs in improving skills, qualifications, and effective policy for labor distribution to industries, especially those with comparative advantages. This would accelerate job generation and improve productivity and growth of industries and thus of the entire economy. The shares of those aged 30–44 years and 45–59 years among productive workers increased quite significantly during the studied period. Given that these groups are increasing in the total population due to the state of "demographic window of opportunity," and also among those with increasing productivity and per-capita income as indicated by Pham [20], the result indicates an important opportunity for Vietnam to grasp benefits for economic growth from these population

groups. In addition to these persons, the research also found that the share of those aged 60–69 years among the productive workers increased twice in the studied period (though it accounted for only 1.5% in 2020). This means that more productive older workers will help Vietnam cope with the issues of aging population in general as well as aging labor force in particular. That nearly 45% of older persons (those aged 60 and above) still work is really a positive sign in mobilizing older workers, but that more than 80% of them are vulnerable workers (i.e., self-employed or unpaid family workers) is a great challenge in social and health protections [10]. Therefore, for the old-age workers, assigning them with appropriate jobs along with various social and health protection programs can absolutely help improve Vietnam's productivity and move it toward an "active aging" society in future.

The research found that there were large gaps in proportions of productive workers in terms of gender (men had a higher proportion of productive work than women) and place of residence (urban people had a higher proportion of productive work than their rural counterparts). These situations could be elucidated by male–female and urban–rural workers' gaps in terms of education, job types, and thus wages. For instance, data from LFS 2020 showed that female and rural workers generally had higher proportions of vulnerable work and lower proportions of social insurance participation than their male and urban counterparts, and thus the wage gaps between these groups have remained over time. Such a situation suggests that formalization and provision of social protection, particularly to female and rural workers should be enhanced so as to employ them in more productive work.

The findings about economic sectors and ownerships were quite similar to those in Giang, *et al* [7], implying that shifting workers to more productive sectors help increase the proportion of productive work.

As UNFPA [23] and GSO, *et al* [10] have showed, Vietnam has experienced two demographic trends at the same time, and it is a great need to change awareness on both opportunities and challenges of these trends so as to formulate adaptive policies and strategies. A "demographic window of opportunity" cannot automatically bring about high growth; rather, it should be facilitated and realized by a favorable policy environment. At the same time, "demographic aging" can be celebrated or challenged, depending on how well it is leveraged. Development of consistent and long-term policies, strategies, and programs across all social and industrial sectors should be prioritized for now. Economic, educational, healthcare, and governance policies are the key.

References

[1] An C.B., Jeon S.H. Demographic Changes and Economic Growth in Korea; 2006. Paper to be presented at the APEA Conference.

[2] Beaudry P., Collard F. Recent Technological and Economic Change among Industrialized Countries: Insights from Population Growth. Scand. J. of Economics 2003; 105(3), 441–463.

[3] Bloom D.E., Williamsons J.G. Demographic Transitions and Economic Miracles in Emerging Asia. The World Bank Economic Review 1998; 12 (3): 419–455.

[4] Minh Tiep B.T. Effects of population age structure changes on economic growth in Vietnam (in Vietnamese). PhD dissertation, National Economics University, Hanoi, Vietnam; 2012.

[5] Faruqee H., Mühleisen M. Population aging in Japan: demographic shock and fiscal sustainability. Japan and the World Economy 2001; 15(2), pp 185–210.

[6] Long G.T., Toan P.N. Estimating NTA for urban and rural areas in Vietnam. Report on NTA study prepared by the Institute of Public Policy and Management, National Economics University; 2012.

[7] Giang T.L., Toan P.N., Phuong P.L., *et al.* Impact of population's age structure changes on economic growth in Vietnam and policy recommendations. Hanoi: UNFPA and MPI; 2015.

[8] GSO (General Statistics Office of Vietnam). Labor Force Survey. Hanoi: GSO; various years.

[9] GSO. Population Projections for Vietnam in 2019–69: Key Findings. Hanoi: GSO; 2020.

[10] GSO, UNFPA, Japan Fund for Poverty Reduction. Population and Housing Census 2019: Population Ageing and Older Persons in Vietnam. Hanoi: Youth Publishing House; 2020.

[11] Heckman J.J. Sample Selection Bias as a Specification Error. Econometrica 1979; vol. 47 (1): 153–161.

[12] ILO. Understanding Deficits of Productive Employment and Setting Targets: A Methodological Guide; International Labour Office, Employment Sector. Geneva: Switzerland, 2012; ISBN 978-92-2-125990-9.

[13] Kelley A.C, Schmidt R.M. Evolution of recent economic-demographic modeling: A synthesis. Journal of Population Economics 2005; 18: 275–300.

[14] Liao P.J. Does Demographic Change Matter for Growth? European Economic Review 2011; vol. 55, issue 5: 659–677

[15] Lee R., Mason A. What Is the Demographic Dividend? Financial & Development, September 2006; vol. 43, no. 3. https://www.imf.org/external/pubs/ft/fandd/2006/09/basics.htm. Accessed on 30 November 2021.

[16] Cu N.D., Anh H.T. Demographic structure change and forecast of demographic window of opportunity in Vietnam. Hanoi: National Economics University; 2010.

[17] Minh N.T. Dynamic Demographics and Economic Growth in Vietnam. Journal of the Asia Pacific Economy 2009: 14 (4): pp 389–398.

[18] Lan Huong N.T., Thu P.M., Toan P.N., *et al.* Population age structure changes in Vietnam and policy recommendations. Report on NTA study submitted to IDRC; 2013.

[19] Xavier O., Pasquier–Doumer L., Roubaud F., *et al.* The adjustment of the labor market in times of economic volatility and restructuring, chapter 6. In: Thanh N.D., ed. Vietnam's Economy Annual Report 2013 On the bumpy road to the future. Hanoi: National University Publishing House; 2014.

[20] Toan P.N. Population age structure changes, demographic dividend and productivity growth in Vietnam (in Vietnamese). Unpublished manuscript for the General Office of Population and Family Planning (GOPFP)'s Workshop on Population and Development in Vietnam, 30 November 2020.

[21] Prskawetz A., Lindh T., eds. The Relationship Between Demographic Change and Economic Growth in the EU, Project: Various studies on the policy implications of demographic changes in national and Community policies, Lot 3. Vienna Institute of Demography. A-1040 Wien, Wohllebengasse 2007; 12–14.

[22] Dat T.T., Nhung D.T. The effect of human capital on economic growth in provinces and cities in Vietnam. Hanoi: The National Economics University Publishing House; 2008.

[23] UNFPA (United Nations Population Fund). Taking advantage of the golden population opportunity in Vietnam: Opportunities, challenges and policy issues. Hanoi: UNFPA; 2011.

[24] UNFPA, HelpAge International. Ageing in the Twenty-First Century: A Celebration and A Challenge. New York and London: UNFPA and HAI; 2013.

CONCLUSION

In order to understand the impact of population aging in various countries and how countries respond to population aging, this project invited experts from Pakistan, the Republic of China (ROC), and Vietnam to write each country's report. Since the three countries face the impact of population aging by different degrees, their actions in dealing with it would also be different.

Pakistan

Like other developing countries, Pakistan is also experiencing an aging population. In Pakistan, according to the UN population forecast, by 2050, the elderly population aged 60 years and above will account for 15.1% of the total population. Currently, 11.6 million people (6.5% of the country's total population) are over 60 years old.

The Pakistan study explores the impact of population aging on Pakistan's economic growth using annual time series data for the period 1990~2020. According to economic theory, population aging seems to have a negative impact on the real GDP. However, its impact is statistically insignificant. This means that population aging is not a big problem for the Pakistani economy in the short run, which is also supported by the fundamental reality that the majority of Pakistan's population consists of young people. However, this could become a potential problem in the long run.

In the short term, Pakistan's population aging is not a big problem, given that the population is younger, the fertility rate is low, and the dependency ratio is also low. In the long run, due to changes in these factors, population aging will have an adverse impact on the country's national income. Sustainable human development policies and programs are needed, in addition to current socioeconomic policies, to turn this demographic dividend into an opportunity.

For Pakistan to reap the benefits of its demographic dividend, it must provide the youth with gainful employment opportunities. From a future policy perspective, as these young workers progress, they will need to support not only themselves but also those who depend on them. Considering the low literacy rate among women, large-scale holistic design solutions are needed to encourage the idea of small family sizes and lower fertility rates on a voluntary basis.

The increase in the proportion of working-age population has had a significant impact on individual as well as aggregate consumption, saving, and employment. Aggregate savings can lead to increased capital formation and increased economic growth. Policy measures that encourage a sustained increase in savings rates through labor market efficiency tend to increase labor force participation and create an age-friendly employment environment. Policy measures that encourage R&D to foster innovation and technological advancement are likely to be the most useful and feasible measures to mitigate the adverse effects of population aging on economic growth. In addition, increasing human capital formation is also an important policy measure, because it can improve labor quality and productivity, which can partially offset the adverse "volume" effect of population aging on the labor force by increasing labor productivity.

The ROC

With decline in birth rate and increase in life expectancy, the ROC has entered the "Aging Society," defined by the UN. In 2018, it became an aging society. By 2020, the share of the population over 65 years old will be 16.07%. It is estimated that in 2025 the ROC will enter a super-aged society, and therefore, developing and utilizing human resources of middle-aged and elderly people has become an important issue in the ROC. In view of this, the ROC passed the "Employment Promotion Act for the Elderly and Elderly" in 2019 in an attempt to remove regulatory obstacles and promote employment for the middle-aged and elderly people.

In addition to paying attention to the impact of digital technology development on middle-aged and elderly workers, based on the experience of other countries, the ROC can also strengthen the employment of middle-aged and elderly people, including the planning and promotion of various measures and programs.

A key factor for the success of progressive retirement measures is not to damage the security of labor retirement benefits.

The age for the ROC's middle-aged and elderly workers to quit the labor market is between 50 and 55 years of age, but the incentives for middle-aged and elderly employees to stabilize their employment start before the statutory mandatory retirement age. Is it possible to achieve the goal of stable employment? It may be useful to refer to Singapore's "Special Employment Subsidy" and lower the age for stable employment subsidies to 50 years of age.

Vietnam

Vietnam is a low-middle-income country that has experienced population aging over the past decade and is projected to become a rapidly aging country in the coming decades. Therefore, to maintain and increase productivity and promote economic growth in the context of population aging is an important policy issue. Toward this end, the circumstances and factors relevant to productive work should be thoroughly explored.

In 2029, Vietnam's elderly population will reach 17.28 million (accounting for 16.53% of the total population); in 2049 it will be 28.61 million (accounting for 24.88% of the total population); and in 2069 it will be 31.69 million (accounting for 27.11% of the total population). If the elderly population is defined as 65 years old and above, the elderly population is expected to reach 12.03 million (11.51% of the total population in 2029); 21.09 million in 2049 (18.34% of the total population); and 25.16 million in 2069 (21.52% of the total population). These projections mean that Vietnam's population will become an "old population" (14% of the population aged 65 years and above) by 2036, with 15.46 million elderly people.

The Vietnam study uses population data from 2009 to 2020 and productive work data from 2010 to 2020 to explore the policy implications of harnessing the "demographic dividend" to accommodate and adequately prepare for a rapidly aging population in the coming decades.

Vietnam's aging population will accelerate in the coming decades, a situation that shows the need to increase the utilization of more productive workers. The study also found that the proportion of young adults (ages 15~29 years) among productive workers has declined over time. Skill mismatch is one of the main reasons for this. This implies the importance of training programs in improving

skills, qualifications, and effective labor allocation policies, especially for industries with comparative advantages, in order to accelerate job creation, productivity, growth of industries, and the economy as a whole. The share of productive workers aged 30~44 years and 45~59 years increased significantly during the study period, and Vietnam could benefit from economic growth in these groups. The study also found that the share of productive workers aged 60~69 years tripled in the study period (though the growth was only 1.5% in 2020). This means that more productive older workers will help Vietnam cope with an aging population and an aging workforce. Nearly 45% of older people (60 years and above) are still working, which is indeed a positive sign for mobilizing older workers, but the fact that over 80% of them are vulnerable workers (i.e., self-employed or unpaid family workers) is a huge challenge. Therefore, for older workers, assigning them suitable jobs with various social and health protection schemes will definitely help increase productivity and move toward an "active aging" society in future.

Vietnam is experiencing two demographic trends at the same time, and there is an urgent need to change the perception on opportunities and challenges of these trends in order to develop adaptive policies and strategies. The "demographic dividend" cannot automatically bring about high growth. On the contrary, it should be promoted and realized through a favorable policy environment. Meanwhile, "population aging" can be celebrated or challenged, depending on how much attention is paid to it. Priority should now be given to develop coherent long-term policies, strategies, and programs across all social and industrial sectors. Economic, education, health, and governance policies hold the key.

LIST OF TABLES

LIST OF FIGURES

LIST OF CONTRIBUTORS

Dr. Chih-Yu Cheng (Chief Expert)
Professor
Graduate Institute of Labor Research
National Chengchi University
Taipei, Republic of China

Dr. Giang Thanh Long
Professor
Faculty of Economics
National Economics University
Hanoi, Vietnam

Dr. Pham Minh Thai
Research Fellow
Institute of World Economics and Politics
Vietnam Academy of Social Sciences and Faculty of Business Management
Hanoi University of Industry
Hanoi, Vietnam

Dr. Iffat Batool Naqvi
Associate Professor
Institute of Science, Technology & Development
Mehran University of Engineering and Technology
Jamshoro, Sindh
Pakistan

Dr. Dilawar Khan
Professor
Department of Economics
Kohat University of Science and Technology
Kohat, Pakistan


APO