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DEMOGRAPHIC STRUCTURE, HUMAN CAPITAL, AND ECONOMIC GROWTH: EVIDENCE FROM TURKEY

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ABSTRACT

Purpose: The aim of this study is to examine the long-run and short-run impact of demographic structure and human capital on the economic growth of Turkey.

Theoretical framework: The shift in demographic dividend which witness shifts in age structures, have led to positive prospects, which have resulted in the decline in rate of births leading to a decline in a country's young dependent group, and subsequently caused an increase in the percentage of the workforce working-age numbers. In the past few decades, there has been a noticeable substantial shift in the population structure with regard to the percentage of the cohort of working age population in Turkey that could have consequences on the economy.

Design/Methodology/Approach: The annual time series data of Turkey for the time period 1990 to 2020 was employed through the utilization of Autoregressive Distributed Lag (ARDL) model to investigate the association between the demographic structure, human capital and economic growth.

Findings: The results revealed that variations in the age structure, as manifested by the variations in the age cohorts of the working-age population, possess substantial favorable impacts on economic growth in the short and long run. The research also revealed that human capital impacts on economic growth in a positive way in the short run.

Research, practical & social implications: The study revealed that there is a substantial shift in the population fabric in Turkey. The ongoing changes that have transpired relatively rapidly might have significant economic consequences for the country in the future. Hence, it is therefore recommended that Turkey acquire demographic and economic measures which will stimulate the population to be intensively involved in the workforce. This is to garner the gains of demographic and educational returns as a major method towards the attainment of a high level of economic growth.

Originality/Value: This study utilizes working age population more broadly than most of the literature, using disaggregated age groups based on age. The key motivation for this is to ascertain the role of each age group, and its effect on economic growth.

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ESTRUTURA DEMOGRÁFICA, CAPITAL HUMANO E CRESCIMENTO ECONÔMICO: PROVAS DA TURQUIA

RESUMO

Objetivo: O objetivo deste estudo é examinar o impacto a longo e curto prazo da estrutura demográfica e do capital humano no crescimento econômico da Turquia.

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Quadro teórico: A mudança do dividendo demográfico, que testemunha mudanças nas estruturas etárias, levou a perspectivas positivas, que resultaram no declínio da taxa de nascimentos, levando a um declínio no grupo de jovens dependentes de um país, e, posteriormente, causou um aumento na percentagem do número de trabalhadores em idade ativa. Nas últimas décadas, registrou-se uma mudança significativa na estrutura da população no que diz respeito à percentagem do grupo da população em idade ativa na Turquia, que poderá ter consequências na economia.
Concepção/Metodologia/Abordagem: Os dados das séries cronológicas anuais da Turquia para o período de 1990 a 2020 foram utilizados através da utilização do modelo Autoregressive Distributed Lag (ARDL) para investigar a associação entre a estrutura demográfica, o capital humano e o crescimento econômico.
Constatações: Os resultados revelaram que as variações na estrutura etária, manifestadas pelas variações nas faixas etárias da população em idade ativa, têm impactos favoráveis substanciais no crescimento econômico a curto e longo prazo. A pesquisa também revelou que o capital humano impacta o crescimento econômico de forma positiva no curto prazo.
Investigação, implicações práticas e sociais: O estudo revelou que existe uma mudança substancial no tecido populacional na Turquia. As mudanças em curso, que ocorreram relativamente rapidamente, podem ter consequências econômicas significativas para o país no futuro. Por conseguinte, recomenda-se que a Turquia adquira medidas demográficas e econômicas que estimulem a população a participar ativamente na força de trabalho. O objetivo é assegurar os ganhos de rendimento demográfico e educacional como um método importante para a realização de um elevado nível de crescimento econômico.
Originalidade/Valor: Este estudo utiliza a população em idade ativa de forma mais ampla do que a maioria da literatura, usando faixas etárias desagregadas com base na idade. A principal motivação para isso é determinar o papel de cada faixa etária e seu efeito no crescimento econômico.

Palavras-chave: Estrutura Demográfica, Capital Humano, Crescimento Econômico, Turquia, ARDL.

ESTRUCTURA DEMOGRÁFICA, CAPITAL HUMANO Y CRECIMIENTO ECONÓMICO: EVIDENCIA DE TURQUÍA

RESUMEN
Objetivo: El objetivo de este estudio es examinar el impacto a largo y corto plazo de la estructura demográfica y el capital humano en el crecimiento económico de Turquía.
Marco teórico: El cambio en el dividendo demográfico, que es testigo de cambios en las estructuras de edad, ha dado lugar a perspectivas positivas, que han dado lugar a una disminución de la tasa de nacimientos que ha dado lugar a una disminución del grupo de jóvenes dependientes de un país, y posteriormente ha provocado un aumento en el porcentaje de la fuerza de trabajo en edad de trabajar. En los últimos decenios, se ha producido un cambio considerable en la estructura de la población en relación con el porcentaje del grupo de población en edad de trabajar en Turquía que podría tener consecuencias para la economía.
Diseño/Metodología/Enfoque: Los datos de las series temporales anuales de Turquía para el período de tiempo 1990 a 2020 se emplearon a través de la utilización del modelo Autorregresivo de Retraso Distribuido (ARDL) para investigar la asociación entre la estructura demográfica, el capital humano y el crecimiento económico.
Resultados: Los resultados revelaron que las variaciones en la estructura de edad, como se manifiesta por las variaciones en las cohortes de edad de la población en edad de trabajar, tienen impactos favorables sustanciales en el crecimiento económico en el corto y largo plazo. La investigación también reveló que el capital humano tiene un impacto positivo en el crecimiento económico a corto plazo.
Investigación, implicaciones prácticas y sociales: El estudio reveló que hay un cambio sustancial en el tejido poblacional en Turquía. Los cambios en curso que se han producido con relativa rapidez podrían tener importantes consecuencias económicas para el país en el futuro. Por consiguiente, se recomienda que Turquía adopte medidas demográficas y económicas que estimulen la participación activa de la población. Con ello se pretende obtener los beneficios de los beneficios demográficos y educativos como método principal para alcanzar un alto nivel de crecimiento económico.
Originalidad/Valor: Este estudio utiliza la población en edad laboral de manera más amplia que la mayoría de la literatura, utilizando grupos de edad desagregados por edad. La principal motivación es determinar el papel de cada grupo de edad y sus efectos en el crecimiento económico.

Palabras clave: Estructura demográfica, Capital humano, Crecimiento económico, Turquía, ARDL.

INTRODUCTION

Past studies that were conducted over numerous decades ago have emphasized the association between the shifts in demography and economic expansion. It is noted that the shift in demographic dividend which witness shifts in age structures, have led to positive prospects, which have resulted in the decline in rate of births leading to a decline in a country's young dependent group, and subsequently caused an increase in the percentage of the workforce working-age numbers. The advantages of demographic dividends have encouraged the domination of this paradigm on the population and various developmental fields. In the past few decades, there has been a noticeable substantial shift in the population structure with regard to the percentage of the cohort of working age population in the Middle Eastern countries that could have consequences on the economy.

Basically, there have been several research that addressed the effect of age structure on economic growth in various economies. For example, studies such as those by Bloom and Williamson (1998), Choudhry and Elhorst (2010), Bloom and Canning (2011), and Cruz and Ahmed (2018) had conducted an analysis on the impact of age structure on the development of the economy, and they concluded that the working population had contributed in a favorable was and possess important impact on the economic development. Thus, the importance of investing in human capital is highlighted due to the correlation between age structure and economic development. Additionally, the influence of human capital on economic development is crucial as human capital has been perceived as the driver of economic growth (Mankiw et al., 1992, Lucas, 1988, Nelson and Phelps, 1966).

Based on the findings of past studies, in addition to the relevant issues pertaining to the impact of the demographic structure on economic growth, the fundamental aim of this study is to minimize the gaps in literature concerning demographic structure in Turkey. This study states working age population as those within the age range of 15–64 years old, more extensively as compared to most definitions found in literature, through the utilization of disaggregated age cohorts according to age. The working-age population is categorized into three age cohorts: (1) young working-age group within the age range of 15 to 24 years old, (2) prime working-age group within the age range of 25 to 44 years old, and (3) old working-age group within the age range of 45 to 64 years old. The key motivation for this research is in ascertaining the part played by each age group, and its effect on economic development (Bawazir et al., 2019, Wongboonsin and Phiromswad, 2017, Zhang et al., 2015, Oliver, 2015). Thus, this research seeks to investigate the association between demographic structure, human capital and

economic growth in Turkey traversing the time frame between 1990 and 2020. The study findings are expected to have significant implications to policymaking and academia, in light of supporting the prior findings upon which future policy decisions can be based on.

The remainder of the sections are organized in the following manner: the next section consists of Section 2 which puts forward a comprehensive examination of pertinent studies. This is ensued by Section 3 that contains demographic trends of Turkey. The next section is Section 4, where the author provides the adopted methodology in terms of model specifications, estimation approach and the study variables. Meanwhile Section 5 provides the verifiable findings. Lastly, this research article culminates in Section 6 which comprises the conclusion.

LITERATURE REVIEW

Among the top key factors in the forthcoming economic and societal perspective scenario is demographic change. Most authors have conducted examinations on the way shifts in the population's size and age constitution impact on economic growth. Furthermore, the channels via which demographic changes influence the economy generally cover the achievement of education and participation of new workforce in the labor market. Accordingly, certain empirical studies have stated that there is an association between demographic composition and arrangement, with education through their impact on the of sustainable economic growth level.

An assessment of relevant research conducted in various countries is presented in the current section. An example of such study was conducted by Bloom and Williamson (1998) whom disclosed that the working age group in the population possesses favorable effects of economic development. Meanwhile, according to a study conducted by Kelley and Schmidt (2005) they created new versatile model for studying a part played by the population in the development of the economy. Subsequently, a combination of demographic change effects constituting 20% of per capita output growth impacts all over the globe were disclosed by them, with Asia and Europe taking larger share proportions. Kögel (2005) reported that age structure impacts the top significant determinant of international differences in terms of per worker output.

Based on a study by Choudhry and Elhorst (2010), Out of China's GDP per capita for the years 1961 to 2003, 46% of the economic growth was the result of population dynamics, Likewise for India and Pakistan, with 39% in India and in Pakistan 25% out of their GDP per capita were the result of population dynamics. From the study by Bloom and Canning (2011),

they contended that the top predictors of economic growth (with income per capita as the proxy) are the growth of the population and the age structure. As in the case of China, Wei and Hao (2010), in their study indicated that the swift economic expansion of China has been considerably attributed to demographic structure changes.

In the study by Aiyar and Mody (2013) disclosed that as for the working age ratio, the level and growth rate were associated with the development of the economy of India. Notably, a significant part of the growth acceleration of the country in the 1980s can be linked to changes in demographics. In a study conducted by Song (2013) in an investigation of such effects on the economic growth in 13 Asian countries for the years ranging from 1965-2009, it was discovered that the working age population has a favorable effect of the economic development.

Additionally, Azomahou and Mishra (2008) in their study concluded that aggregate population growth and the younger age population growth have a favorable impact on the economic growth of countries which are apart from OECD countries. Meanwhile the impact of the retired cohort's growth is observed to be negative on the same. They also reported that non-OECD countries have the prospects of experiencing further growth opportunities from the accrual of working age cohort in the population. Hajamini (2015) indicated that population age structure changes influence per capita income. The study revealed the importance of bringing about shifts in the age structure of the population as opposed to the expansion in the population of the developing nations.

Furthermore, based on a study by Cruz and Ahmed (2018), the influences of demographic shift on the development of the economy and on the state of poverty of 180 countries between 1950 and 2010 was analyzed. They utilized the shifts in the portion of the working age cohort in the population and dependency ratios to gauge the shift in the demography. Results of the study reveal that a rise in the proportion of the working age cohort in the population has a favorable impact on the per capita gross domestic product growth. The impact of demographic change on the development of the economy in China was explored by Hsu et al. (2018). They discovered that generally in China, the demographic shifts are responsible for approximately 4% of the country's development. Meanwhile, the demographic shifts have a negative impact on the country in the period before 1980.

In addition, a study executed by Sánchez-Romero et al. (2018) had highlighted on the influence of the demographic changes on the per-capital income growth in Western European countries. Insights from the top finding indicated that the increase in longevity and decrease in fertility constituted approximately 17% of the increase in per-capital income growth. Ahmad

and Khan (2019) stated that the ratio of working age cohort and the growth rate of the labor force possess substantial favorable impacts of the economic development in the developing countries. They concluded that to exploit the advantages of demographic transition, it is critical to develop suitable combination of jobs opportunity that enable workers to contribute to the economy. Predominantly, human capital and demographic transition play an important part in being economic growth determinants in the presence of economic policies.

In addition to the studies, recent studies have examined the effect of the working-age cohort's internal demographic composition on the development of the economy. On another note, Oliver (2015) in his study in Japan, determined the association between population composition and the shift in the structure of economic system (proxied by real gross domestic product per capita) for the period ranging from 1975 to 2011. The outcomes illustrate the fact that a rise in the number of age cohorts (15 to 24 years old, 25 to 34 years old, 45 to 54 years old, 55 to 59 years old and 77 plus years old) are associated with a rise in the real gross domestic product per capita. Whereas a rise in the aged cohort in the population pool, within the age range of 70 to 74 years old, and a rise in the youth dependence ratio are both associated to a decline in the GDP. These signify that with the entire factors being constant, and in instances when there is decline in the working-age cohort numbers in the population pool, then there will also be a reflective decrease in GDP per capita growth.

Zhang et al. (2015) focused on the demographic age structure economic impact in China, with the assistance of panel data sets obtained from 28 provinces in the country. Based on the analysis findings, they reveal that age structure changes (shifts in the extent and internal demographic composition) related to the working-age cohort in the population, have an obvious influence on the economic growth rates in the provinces. In the period of the study (1990-2005), the age structure evolution constituted for approximately one-fifth of the GDP per capita growth, from which over half is related to internal demographic composition changes in the working-age population.

Moreover, Wongboonsin and Phiromswad (2017) assessed the effects of the demographic structure on the growth of the economy in 122 countries from 1960 to 2010. Their population classification involved five categories, with the young population being younger than 15 years old, the young workers aged within the age range of 15 up to 24 years old, the middle-aged workers aged within the age range of 25 up to 44 years old, the senior workers aged within the age range of 45 up to 64 years old, and the senior population comprising those of over 65 years of age. Such categorization enables the potential explanation that varying age

cohorts have varying impacts on the growth of the economy. According to the outcomes attained, cohorts of young labor force, middle-aged labor force and senior labor force possess a favorable association with the development of the economy. Conversely, the cohorts of young population and senior population have a negative association with the economic growth.

Additionally, the demographic structure impact on the economic growth in Middle Eastern countries over the period of 1996 to 2016 was examined by Bawazir et al. (2019). They classified the working age cohort in the population into three age cohorts, consisting of young working-age cohort (between the ages of 15 to 24 years old), middle-aged cohort (between the ages of 25 to 44 years old), and old working-age cohort (between the ages of 45 to 64 years old), that are segregated according to gender; either male or female. Based on their findings, they discovered that the young working-age group, middle-aged group, and old working-age group possess a favorable influence on the economic growth, while the gender analysis illustrated that the male working age population have a greater significant influence of the economic growth in comparison to their female gender counterparts.

According to a study carried out by Ursavaş (2022) on West African States, they investigated the connection between accelerating rates of population development and demographic composition. The results showed that urban population as well as life expectancy have a beneficial effect on the probability of development accelerations. In the context of Sub-Saharan African countries, TESSEMA (2022) in their study had determined the impact of the growing population. The findings showed that there was a correlation of one-to-one between the development of GDP per capita and the surge in population, which suggests that demographic expansion is beneficial to the economy.

Based on a study carried out by Taguchi and Latjin (2022) in an examination of effects of demographic dynamics on economic growth in 19 European Union economies. The findings indicated that there are favorable impacts of increasing life expectancy and the proportion of the population that is of working age on the expansion of the economy. In addition, a study executed by Amornkitvikai at al. (2022) used data pertaining to Asian economies to investigate the effect that demographic structural changes have on economic growth. They concluded that the proportion of the population that is of working age has important and beneficial effects on economic expansion.

When it comes to age structure, another variable that has been examined in literature is population aging, with many studies viewing population aging hampers economic growth. For instance, Maestas et al. (2016) discovered a rise of 10% in the fraction of the population aged

above ages 60 old reduces the GDP per capita growth rate by 5.5% in the United States of America states. Outcomes of the study implicate that there has been lagging of the annual GDP growth by 1.2 % points these ten years and will lag by 0.6 % points by the next ten years caused by the ageing population. Moreover, Cuaresma et al. (2016) reported that in Europe, the current economic growth shows a movement in the distribution of age of the labor force towards elderly aged cohorts, and greater ratio of old age dependency, which are equally linked in general, to the lesser growth rate of the GDP per capita income.

Kajimura (2020) found that increasing the ratio of elderly people have a negative impact on the economic growth in the long term. Hence, the countries need to increase labor force growth rate to balance decline in economic growth caused by ageing population. In a study of Turkey, Ecevit et al. (2021) discovered that population aging, and financial development had a negative impact on economic growth, whereas domestic savings and consumption expenditures were positively related to economic growth in the long run. The findings also showed that in the long run, there is bidirectional causality between all the independent variables and economic growth. Additionally, Chishti at al. (2022) in their study concluded that the total negative impact is greatest in the case of old-age dependency, which implies that an increase in old-age dependency poses the greatest threat to economic growth.

On the contrary, Mamun et al. (2020) found that ageing population possesses a positive impact on per capita real GDP in Bangladesh in the long run duration. This may be due to the fact that there is an increasing capital formation process in the economy. In the case of Australia, Uddin et al. (2016) had studied the association between the ratio of dependency and real GDP for duration of the years from 1971–2014. In sum, population age structure changes significantly affect real GDP per capital in the Australian context, but such benefit may be phased out in the forthcoming time due to the forecasted rise in the dependency ratio because of the ageing population. Another such study is Liu et al. (2022) who highlighted the importance of the aging workforce to overall production, calling it a key driver of long-term economic expansion.

For the South Asian countries, Munir and Shahid (2020) concluded that fertility rate and life expectancy have a favorable impact on the economic growth in the long run. Meanwhile the impact of the increasing in young dependency is observed to be negative on the economic growth. In the context of the Middle East countries, there have only been a few recent studies devoted towards the examination of the impact of the age structure of the population on the expansion of the economy. For example, Rizk (2019) conducted an investigation on the

association between the demographic transition and the economic growth through the utilization of time series data in Egypt. According to the findings, the expansion of working age cohort in the population stimulated the GDP per capita in both the long-term and short-term duration.

Miri et al. (2019) also investigated the impact of age structure of the population on the Iranian development of their economy ranging between the years 1987 up to 2017. The authors discovered a favorable and substantial impact of growth of 0-14 years old population on the development of the economy in the long duration of time. However, the elderly generation of the population aged over 64 years old possess an unfavorable and important long duration impact on the growth of the economy. In addition, the cohort of 14 to 64-year-olds possess a positive and important impact on the economic growth for both the long and short terms. They concluded that increasing the share of older than 64 years old group minimizes the marginal tendency to saving. This group form challenges for the formation of capital, which minimize the capital per capita, hence resulting in an unfavorable impact on the development of the economy.

A research conducted recently by Saxena (2019) emphasized on the instances of the opening and closure of demographic window for prospects in the economy, and discovered the time span for the attainment of the demographic dividend from 22 Middle Eastern countries. He found that the expected duration of demographic window differs for different country groups of the 22 Arab countries. In summary, the countries' governments need to execute advanced preparations for the generation of employment opportunities for new participants of the working age groups. If the governments can create job opportunities for the workforce members, the countries would obtain the optimum dividend that could increase the GDP of the countries, and with the injection of female workforce, there could be doubling of the GDP.

There are only a handful of authors of recent literature, who emphasized the interactive part played by the age structure and human capital on the development of the economy. For instance, a study conducted by Lutz et al. (2019) had studied the significance of shifts in the age structure and the increase in human capital, and their impact on the economic expansion of 165 countries for the period from 1980-2015. As key factors of true demographic dividend, the authors stressed education enhancement over the age structure and human capital dividend. Therefore, it is pertinent for the global population policies to cater in supporting the human resource base towards the achievement of sustainable development. In a study of ten Middle East countries, Bawazir at al. (2021) revealed that human capital (taking the education levels

to be a proxy) has a positive influence on economic growth. One of their main recommendations to the government is that it prioritizes the growth of its human resources.

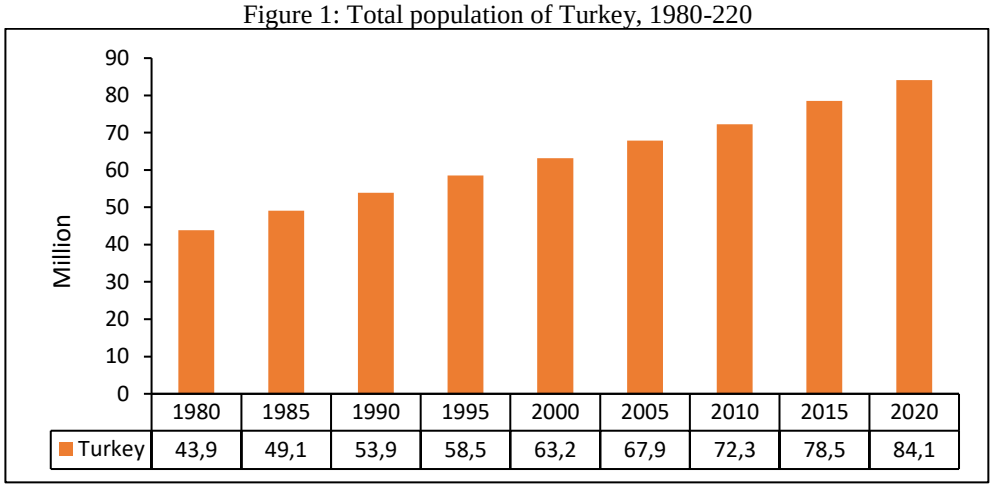
In the context of African countries, Ojewuyi and Alimi (2019) in their study had examined the impact of age structure and human capital development on the Nigerian and South African economic development with the help of ARDL Model and annual data that ranged from the year 1991 to 2017. The authors revealed that working age share are not able to improve the growth of the economies as it must be reinforced by enhanced investment on human capital. Thus, it is crucial for governments to focus on prioritizing all levels of education and identifying skills/competencies that could lead to a functional and productive education.

In the study by Adeleye at al. (2022) who investigated the dynamics of population development as well as the dynamics of the growth of human capital in 19 MENA countries. According to the findings, economic development is positively influenced by population growth and human capital indicators. Furthermore, in the study by Hirono (2021), it was demonstrated that an increase in life expectancy influences the development of income per capita and that this influence is dependent on the productivity of both the education and non-education sectors. A recent study by Berde and Kurbanova (2023) indicated that the demographic advantage is enhanced by human capital, specifically educated, and employed individuals. In Jordan, Alwedyan at al. (2023) concluded that there is an effect of the strategy of empowering human resources represented by participation in decision-making, freedom of responsibility, training and education in achieving strategic goals in the Banks Industry. According to a study carried out by Arwani at al. (2023) in Central Java Indonesia. The results showed that the Human Development Index significantly affected poverty.

DEMOGRAPHIC TRENDS IN TURKEY

The total population increased significantly in Turkey from 43.9 million in 1980 to 84.1 million in 2020 as shown in Figure1. However, despite this increase, annual growth rates declined from 2.3% in 1980 to 1.5% in 2020. These results are explained by the declining crude birth rates and the crude death rates.

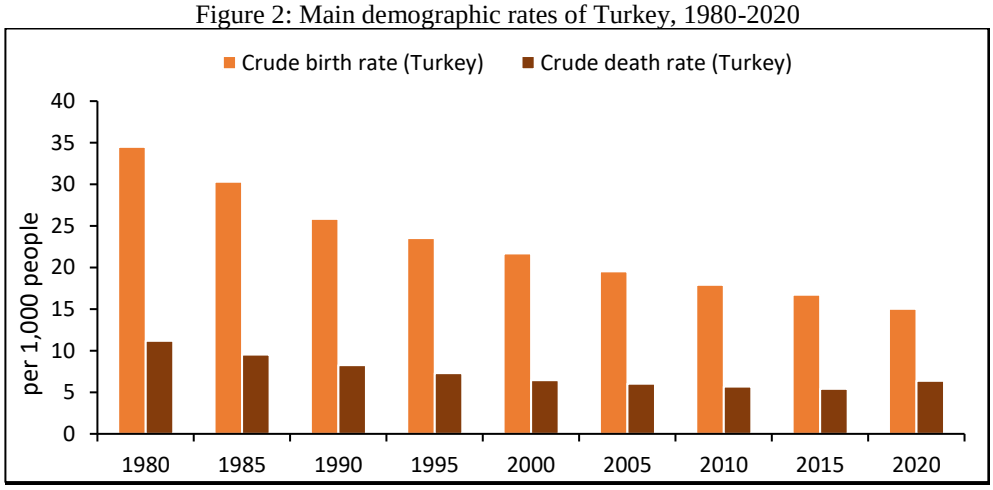
Figure 1: Total population of Turkey, 1980-220



Source: World Bank (2023).

Population increases can be related to natural increases, while declines are attributed to rates of crude birth and death. Figure 2 highlights the main trends in the demographic rates for Turkey. The crude birth rates decreased from 34.5% in 1980 to 15% in 2020. Furthermore, the crude death rates declined from 11.2% in 1980 to 6.4% in 2020.

Figure 2: Main demographic rates of Turkey, 1980-2020

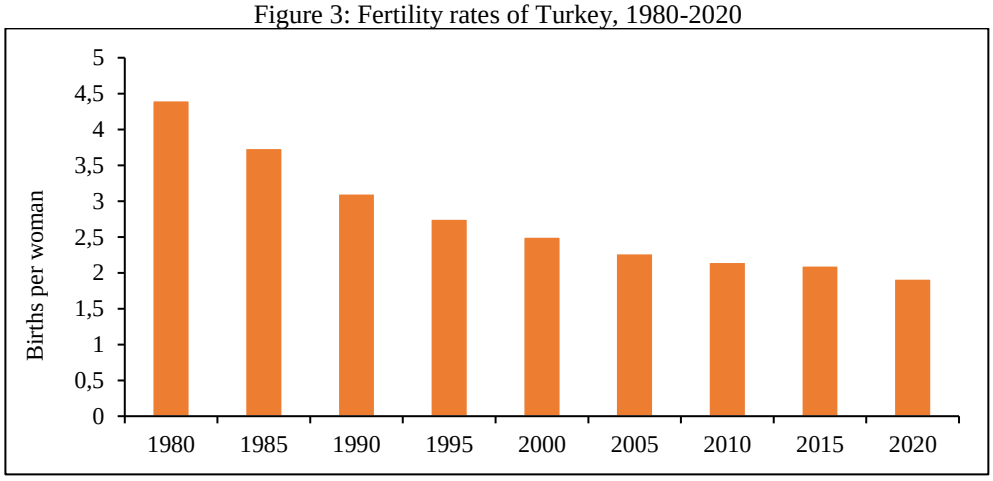


Source: World Bank (2023).

Among the significant indicators of an ageing population is the rate of fertility. The low fertility and longer life expectancy have contributed to the ageing of the population. This phenomenon is demonstrated by a decreased fertility rate leading to an increase in the elderly population. Although this does not affect older individuals in terms of their life expectancy, this adds to their higher proportion in the population mix. Moreover, in the context of the Middle Eastern countries, there have been enhancements in the life quality and rapid economic growth, which in turn have led to lower rates of fertility and longer life expectancy. More specifically, the rate of fertility dipped from 4.4 births for every individual woman in 1980 to 1.9 births in

2020 in Turkey. Please refer to Figure 3. Such a declining trend has added to the higher working-age population proportion.

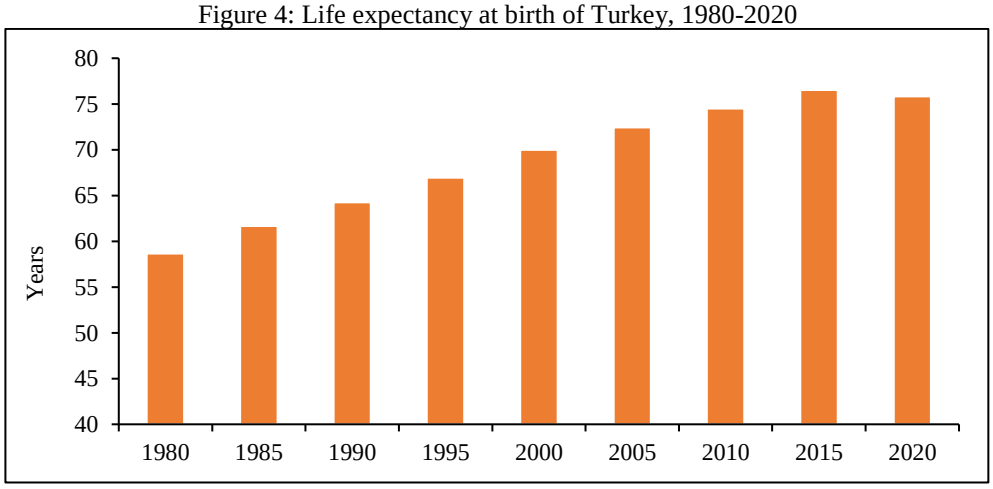
Figure 3: Fertility rates of Turkey, 1980-2020



Source: World Bank (2023).

Regarding life expectancy at birth, in 1980 it has increased from 58.7 years to 70.1 years for Turkey in 2000. The life expectancy at birth further increased, with 75.85 years for Turkey in 2020 as can be seen Figure 4.

Figure 4: Life expectancy at birth of Turkey, 1980-2020

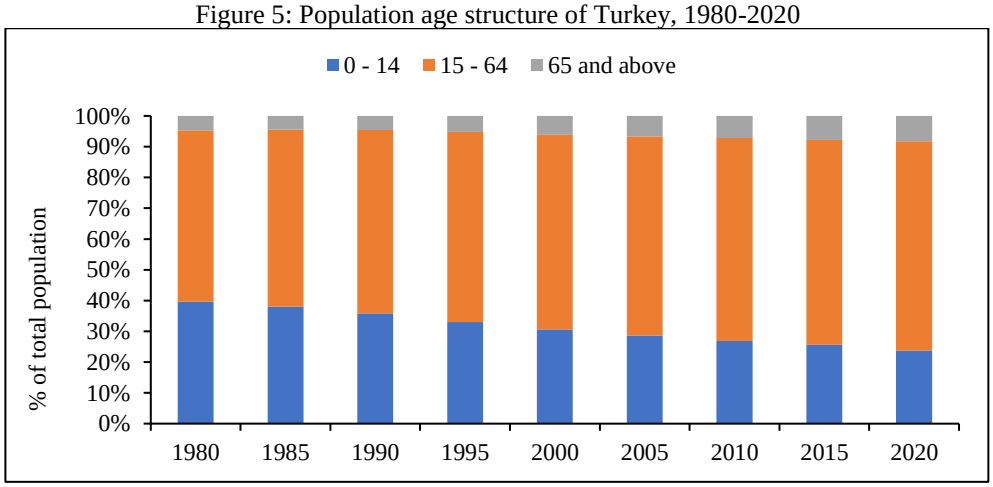


Source: World Bank (2023).

Figure 5 presents data on the population age constitution, where it can be seen that the percentage of population below the age of 15 years decreased from 39.6% in 1980 to 23.7% in 2020 in Turkey. In contrast, the percentage of population in the age range from 15 to 64 years old can be seen to have continuously increased from 55.6% in 1980 to 68.12% in 2020. Similarly, the number of elderlies who are aged 65 years old and over showed a substantial rise from 2.1 million persons in 1980 to 6.9 million persons in 2020, representing approximately

8.5% of the total population in Turkey. This is reflective of an ongoing rise in the percentage of the population aged over 65 years old, and the prediction is that this situation will persist in the coming years. An ageing population could imply increase old-age dependency ratio, greater fiscal expenditures, and lower support ratio – which all ultimately leads to economic shrinkage. Additionally, an ageing population may impact the national output per capita via labor productivity and employment to population ratio as revealed by Guest (2005).

Figure 5: Population age structure of Turkey, 1980-2020



Source: World Bank (2023).

Overall, the working age cohort in the population aged between 15 years old up to 46 years old represented more than 66.6% of the total population in Turkey. Age-structure change brings temporary opportunities for the gaining of benefits, where subsequently the ageing population eventually limits the growth of the economy. As such, a boost in the proportion of the young population is a demographic force that provides opportunities which are to be seized by countries. Additionally, the labor force quality is equally deemed as a driving force in the economic growth, taking into consideration the average education level and higher force participation, which would enhance future growth.

METHODOLOGY

Model Specifications and Estimation Approach

The current research utilizes the augmented Solow model proposed by Mankiw et al. (1992) which comprises the accrual of human capital in addition to physical capital in developing a more refined theoretical form of the Solow growth model. The model is hence defined as:

$$Y = K^{\alpha} H^{\beta} L^{1-\alpha-\beta} \quad (1)$$

Where,

Y= output, K= physical capital, H= human capital, and L= labor force. If both sides of equation (1) are converted to logarithm:

$$log\ Y_t = \alpha\ log\ K_t + \beta\ log\ H_t + (1 - \alpha - \beta)\ log\ L_t \quad (2)$$

Consequently, for the purpose of examining the association between the demographic structure, human capital and economic growth in Turkey, the current research utilizes the model used by Bloom and Williamson (1998), Kelley and Schmidt (2005), and Ahmad and Khan (2019). The model specified:

$$GDP = f\ (YW,\ MW,\ SW,\ SEC,\ AYS,\ GCF,\ FDI) \quad (3)$$

Where,

GDP is real GDP per-capita, YW denotes the young working-age cohort (ranging from the ages 15 to 24 years old), MW signifies the prime working-age cohort (ranging from the ages 25 to 44 years old), SW signifies the old working-age cohort (ranging from the ages 45 to 64 years old), SEC denotes secondary school enrollment ratio, and AYS signifies the average years of schooling. Moreover, GCF represents gross capital formation and FDI denotes foreign direct investment. The variables in totality are incorporated in the model for the purpose of avoiding under-specification. The form of equation (3) is expressed as:

$$GDP_t = \alpha_1 + \alpha_2 YW_t + \alpha_3\ MW_t + \alpha_4\ SW_t + \alpha_5\ SEC_t + \alpha_6\ AYS_t + \alpha_7\ GCF_t + \alpha_8\ FDI_t + \pounds_t \quad (4)$$

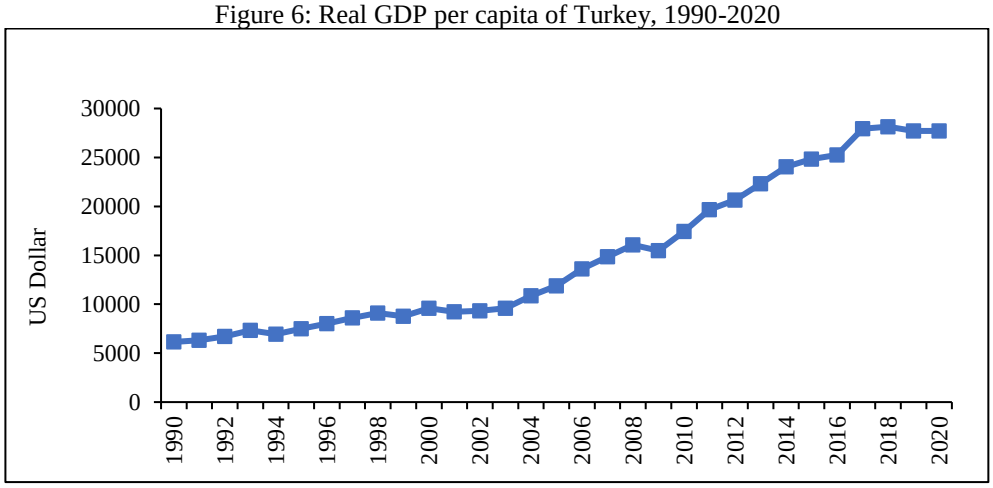
The current research utilizes Autoregressive Distributed Lag (ARDL) approach for cointegration as created by Pesaran et al. (2001) to study the association between the demographic structure, human capital and economic growth in Turkey. Amongst the topmost objective of choosing the ARDL method is its range of application irrespective of whether the regressors are I(0) or I(I) or co-integrated in a mutual way. Another objective for adopting ARDL is due to its robustness, and its ability to achieve optimum results for smaller-sized samples in comparison to using co-integration methods (Narayan, 2004). In particular, the ARDL analysis contains several stages namely, optimal lag determinants, testing for co-integration through the employment of the Bound test, and assessing the associations (in the long and short-run). In addition, it involves conducting diagnostic and stability tests, which are

Jarque Bera normality test, Breusch-Godfrey serial correlation test, heteroskedasticity test, Ramsey Reset test, cumulative sum of recursive residuals (CUSUM), and cumulative sum of squares of recursive residuals (CUSUMSQ), for the purpose of establishing the validity of the ARDL models.

Variable Construction and Data

To investigate the association between the demographic structure, human capital and economic growth, the annual time series data of Turkey for the time period 1990 to 2020 was employed. As for economic growth, the real GDP per capita was employed as a proxy. Figure 6 illustrates the way the real GDP per capita expanded in Turkey between 1990 and 2020. Generally, the real GDP per capita for Turkey have risen substantially in the past few years. The real GDP per capita in Turkey increased four folds in 2020 than it was in 1990.

Figure 6: Real GDP per capita of Turkey, 1990-2020



Source: World Bank (2023).

Based on recent studies conducted by Oliver (2015), Zhang et al. (2015), Wongboonsin and Phiromswad (2017), as well as Bawazir et al. (2019), the categorization of the working-age population is categorized into three age cohorts: young working-age group (within the age range of 15 to 24 years old), prime working-age group (within the age range of 25 to 44 years old), and old working-age group (within the age range of 45 to 64 years old). The impetus and principal grounds for this is to determine the part played by individual age group, and its impact on the economic growth in the countries observed. Based on the study by Wongboonsin and Phiromswad (2017), they categorized the working age population into age categories, enabling the potential for each group to have a distinct observable impact on the economic growth.

Table 1 presents the classification of working-age population by age group. Turkey underwent extensive shifts in age structure over the duration of time between the years 1990 up to 2020, encompassing growths in the ratios for both the prime working-age group and the old working-age group, while there were declines in the ratio of the young working-age group. The rising propensities for both ratios of the prime working-age group and old working-age group, and the decreasing ratio of young working-age group is the same as the propensities demonstrated in the developed countries that undergo an ageing population.

Table 1: Working-age population by age group (%), 1990 and 2020

Country	**1990**	**2020**
Young working-age group	19.5	16.6
Prime working-age group	26.0	31.0
Old working-age group	14.1	20.1

Source: World Bank (2023)

The current research employed two differing proxies for human capital: (1) secondary school enrollment ratio, and (2) average years of schooling. Additionally, other variables are included, namely gross capital formation to be a proxy for physical capital stock, in addition to foreign direct investment as a control variable. Data were obtained from the World Development Indicators published by the World Bank (World Bank, 2020). The descriptive statistics for the entire variables in the analysis for Turkey are documented in Table 2.

Table 2: Descriptive statistics of variables

Variables	GDP	YW	MW	SW	SEC	AYS	GCF	FDI
Mean	14005.04	18.45	29.16	16.45	79.91	6.13	2.27	1.21
Max	28139.14	19.88	30.77	20.41	107.62	7.90	30.99	3.65
Min	6146.26	16.31	25.99	14.05	50.29	4.50	0.11	0.31
Std. Dev.	7141.14	1.33	1.53	2.10	17.71	1.19	7.76	0.91

Note: GDP, YW, MW, SW, SEC, AYS, GCF and FDI represents real GDP per capita, young working-age group (YW), prime working-age group (MW), old working-age group (SW), secondary school enrollment ratio (SEC), average years of schooling (AYS), gross capital formation (GCF) and foreign direct investment (FDI) respectively.
Source: Prepared by the authors (2023).

RESULTS AND DISCUSSION

Unit Root Test

It is imperative for unit root tests to be conducted to indicate the order of integration of the variables utilized. The current research utilized both the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) unit root tests, wherein the null hypothesis tested states that a unit root exists, with no unit root as an alternative hypothesis.

The outcomes of the ADF and PP unit root test were documented in Table 3, that illustrates that young working-age group (YW), prime working-age group (MW), and old working-age group (SW) and gross capital formation (GCF) are stationary at level, while real GDP per capita (GDP), secondary school enrollment ratio (SEC), average years of schooling (AYS) and foreign direct investment (FDI) are stationary at first difference for Turkey. Both the unit root tests namely ADF and PP supported the variables stationary at level and first difference, indicating the ARDL model usage is appropriate for the estimation of the correlation between demographic structure, human capital and the expansion of the economy of Turkey.

Table 3: Unit root test results

Variables	ADF Test		PP Test	
	Level	First Diff	Level	First Diff
GDP	0.512	-4.966***	0.512	-4.966***
YW	-3.268*	-2.509	-3.313*	0.893
MW	-4.079***	-3.303*	-3.600**	1.508
SW	-4.079***	-3.406*	-4.002***	-1.616
SEC	-0.951	-5.071***	-0.868	-5.173***
AYS	0.735	-4.395***	0.612	-4.474***
GCF	-2.731*	-5.988***	-2.731*	-6.240***
FDI	-1.937	-4.492***	-1.937	-4.469***

Note: GDP, YW, MW, SW, SEC, AYS, GCF and FDI represents real GDP per capita (GDP), young working-age group (YW), prime working-age group (MW), old working-age group (SW), secondary school enrollment ratio (SEC), average years of schooling (AYS), gross capital formation (GCF) and foreign direct investment (FDI) respectively. * denotes 10%, ** denotes 5%, and *** denotes 1% level of significance.
Source: Prepared by the authors (2023).

Bounds Test Results

The bounds test seeks to attain the long-term association in relation to the demographic structure, human capital, and economic growth of Turkey, with the ARDL bounds for co-integration used to conduct a comparison between the F-statistic value and the critical bounds value. The F-test results are tabulated in Table 4, within which the value is 6.196 for Turkey, both outside the critical bounds value. Hence, the null hypothesis of no co-integration was rejected at the significance level of 1% in each individual level. It can be stated that there exists a long-run association between demographic structure, human capital, and economic growth in Turkey.

Table 4: ARDL bounds test result for cointegration.

F-Stat	6.196
Significance level	**Lower Bound**
1%	2.54
5%	1.97
10%	1.7

Source: Prepared by the authors (2023).

Estimation of Long-Run Coefficients with the Associated Error Correction Term

The long-run relationship between demographic structure, human capital and economic growth in Turkey is supported by the bounds test. Subsequently, in the next step, the long-run coefficient and the related error correction model is assessed through the utilization of optimal lag lengths. The optimal lag structure of the ARDL model is chosen based on Akaike Information Criterion AIC. Added to this, the lag order of individual ARDL models is used to obtain each variable's optimal lag length (refer to Appendix A).

The estimation of the short and long run ARDL results are indicated in Table 5. The outcome indicates that for Turkey, the young working-age group, prime working-age group, and old working-age group have an important and positive impact on the growth of the economy, in both short and long run. The estimated coefficients illustrate the involvement of the shifts in age structure in the growth of the GDP per capita of the country, confirming the importance of a relatively large working-age population in encouraging the growth of the economy. The result is in line with the outcome obtained by Bloom and Williamson (1998), Bloom and Canning (2004), and Choudhry and Elhorst (2010) who discovered positive relationship between the proportion of the working-age population and the growth of the economy. In addition, Song (2013) espoused that the rapid development is the economy is attributed to the growth of the working-age group of the population in thirteen Asian countries. In the research by Ahmad and Khan (2019), the findings revealed a positive correlation between the working age group of the population and the growth of the economy in the developing countries. These results are in alignment with other similar recent findings of Ursavaş (2022), TESSEMA (2022), Taguchi and Latjin (2022), Amornkitvikai at al. (2022) who discovered that the working-age population share has significant and positive impacts on economic growth.

On the account of the human capital proxies, the present study discovered that the secondary school enrollment ratio and the average schooling years over a period of long-run possess no impact on Turkey's economic growth. However, the variables possess a positive impact on Turkey's economic growth over a period of short run. The findings indicate that educated people can contribute to the economy. The study outcomes are like the outcomes of previous studies. In a related study, Siddiqui and Rehman (2017) showed that human capital had a role in the South East Asian countries' economic growth, while Issa (2005) highlighted the direct stimulation of human capital to such growth. Moreover, SSA of human capital gauged through primary and secondary school enrolment positively affected the growth of the economy (Ogundari and Awokuse, 2018). Furthermore, based on the study done by Awad et al. (2013),

both secondary and tertiary education significantly affected the growth of the economy in Arab countries from 1990 to 2010. As for the physical capital influence on the growth of the economy, the study found a significant positive gross capital formation influence on the growth of the economy for both the duration of the short and long-run. The higher capital formation is forecasted to heighten the growth of the economy and is aligned with the premise advocated by the Solow-Swan model. Infrastructure (roads, railway lines, energy transmission sources, airports, machinery, dams, and the like) enhance the output.

Concerning foreign direct investment, the outcomes reveal that FDI possesses null impact on the growth of the economy in the long run duration in Turkey. However, FDI possesses a positive impact on growth of the economy in the short run duration.

In addition to the instances, a negative and significant coefficient of Error Correction Term (ECT) was found, indicating adjustments of 85.5% of the pathway for the short-run to long-run equilibrium.

Table 5: Estimated Short and Long run ARDL Result

Variables	Coefficient	Prob.
Long run Estimate		
YW	0.079	0.147
MW	0.120	0.000***
SW	0.147	0.006***
SEC	-0.001	0.247
AYS	-0.055	0.418
GCF	1.460	0.000***
FDI	0.014	0.197
Short run Estimate		
Δ YW	2.689	0.001***
Δ MW	0.737	0.021**
Δ SW	1.329	0.001***
Δ SEC	0.001	0.007***
Δ AYS	0.053	0.089**
Δ GCF	1.264	0.000***
Δ FDI	0.015	0.013**
ECT (-1)	-0.855	0.000***

Note: YW, MW, SW, SEC, AYS, GCF and FDI represents young working-age group, prime working-age group, old working-age group, secondary school enrollment ratio, average years of schooling, gross capital formation and foreign direct investment respectively. * denotes 10%, ** denotes 5%, and *** denotes 1% level of significance, respectively.
Source: Prepared by the authors (2023).

Diagnostic and Stability Tests Results

The current research had conducted a few diagnostic tests for the purpose of validating the ARDL models which were utilized to access the correlation between demographic structure, human capital, and economic growth in Turkey. The tests consist of the Jarque-Bera normality

test, Breusch-Godfrey serial correlation test, Breusch-Pagan Godfrey heteroskedasticity test and Ramsey Reset test. Table 6 depicted the diagnostic tests outcomes.

The outcomes attained from individual model specification on all the short-run diagnostic tests can be found in Table 6, and they indicate having the normally distributed error term, absence of serial correlation, absence of heteroscedasticity as well as containing the correct specification of the model. The null hypotheses residuals are free from serial correlation, from heteroscedasticity, with normally distributed error terms and correct specification of models and as such, it cannot be rejected at the level of 5% significance as evident from the tabulated probability values.

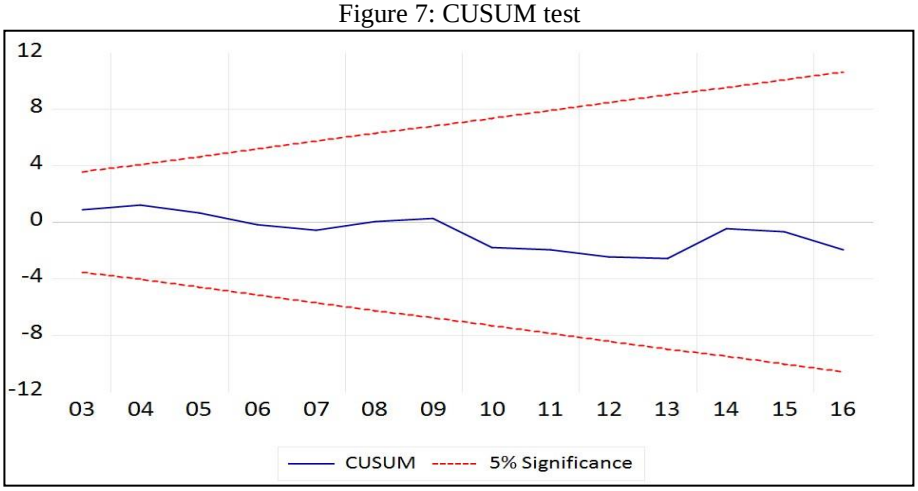
Table 6: Diagnostic tests results

Diagnostic tests	Turkey	
	Coefficient	Prob.
Normality	0.510	0.775
Serial Correlation	5.576	0.299
Heteroskedasticity	0.817	0.674
Ramsey Reset	0.035	0.863

Source: Prepared by the authors (2023).

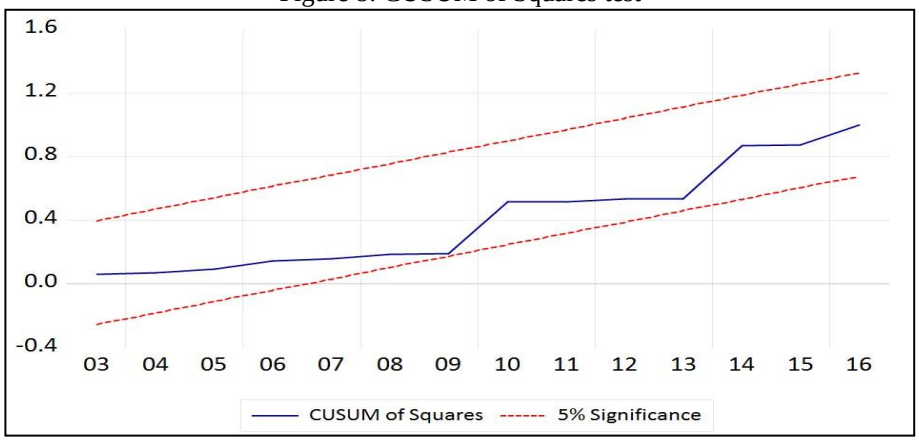
Lastly, the stability test is utilized for the models for the purpose of checking the stability of the long-and short-term parameters. Figures 7 and 8 show results of stability tests, that is, CUSUM and CUSUMSQ for Turkey. With regards to the CUSUM and CUSUMSQ tests results, both graphs lay between the 5% critical bounds level of significance, indicating stable and efficient model coefficients.

Figure 7: CUSUM test



Source: Prepared by the authors (2023).

Figure 8: CUSUM of Squares test



Source: Prepared by the authors (2023).

Generally, the association between demographic structure, human capital and economic growth have been addressed in Turkey in this study. The shifts in age structure led to economic growth prospects. The question of the possibility of such a prospect is contained and supported by the individual country's policy situation. To gain the complete benefit of demographic changes. It is imperative for the government to develop demographic policies which encourages a reduced dependency ratio and heightened savings rate, with a greater level of capital formation to improve economic growth.

The high ratio of the working age population to dependents can lead to high capital and in turn, result in an increased national per capita income. In case a significant proportion of generations achieve prime working-age population and saving-age population, this may result in a prompted increase in economic growth through demographic means induced. This is attributed to the fact that greater level of participation in the work-force results in an intensified labor market dynamism, and enhanced levels of skilled labor. Consequently, this will lead to a more flexible economy, in addition to an enhanced capability of responding to shifts in economic trends. Nevertheless, the demographic changes of these types do not automatically generate dividends payment and for the benefits to arise, it is a must for countries to inject investments in education for the training of the future cohort of workforce successor, in addition to managing their economies to promote stable situations and appropriate jobs for them.

CONCLUSION

The current empirical research investigated the impacts of demographic structure and human capital on the economic growth in Turkey during the time span of 1990-2020. The study has segregated the working-age population into three cohort categories, namely young working-

age group, prime working-age group, and old working-age group. The Autoregressive Distributed Lag (ARDL) model was utilized to test the empirical models. The data showed that Turkey underwent outstanding shifts in its age structure throughout the time span of the research from 1990 up to 2020. The data presented rises in the ratios for both the prime working-age group and the old working-age group, with a conversely declines in ratio for the young working-age group. The trends attributed to the working-age population age groups are akin to those in the developed nations which are experiencing an ageing population.

The outcomes depicted that age cohorts of the working-age population comprising the young working-age group, prime working-age group, and old working-age group possess a substantial favorable impact on the economic growth in both the short and long run term. The research also discovered that the human capital variables possess a favorable impact on the growth of the economy in the short term run. For the long run, the outcome revealed the absence of impact of the human capital on the growth of the economy.

According to the research findings, there has been a continuous increase in the population structure and significant changes, which could have significant implications to the economies of both countries in the future. The chance to obtain benefits owing to the age structure changes does not persist, and the ageing population will subsequently result in the inhibition of the economic expansion. Hence, boosting the working-age cohort in the population of the countries will pave the way for opportunities, which must be leveraged. Turkey needs demographic and economic policies that encourage population to actively take part in the workforce and various industries for productivity to be enhanced, subsequently enabling contribution to a high-income economy achievement.

Several recommendations are forwarded for future studies to investigate the correlation among demographic structure, human capital, and economic growth. Firstly, future work related to this area of study could extend the size of the sample to include other Middle Eastern countries to give a clearer picture of demographic and educational dividends. The results of those studies can be compared with this study to ascertain any differences. Secondly, human capital is not only dependent on formal education but also on education quality, health, skills and cognition aspects. For this reason, in addition to gross enrolment ratios, researchers can include other variables as proxies of human capital to check whether human capital sustains its effect on the economic growth in the presence of these factors.

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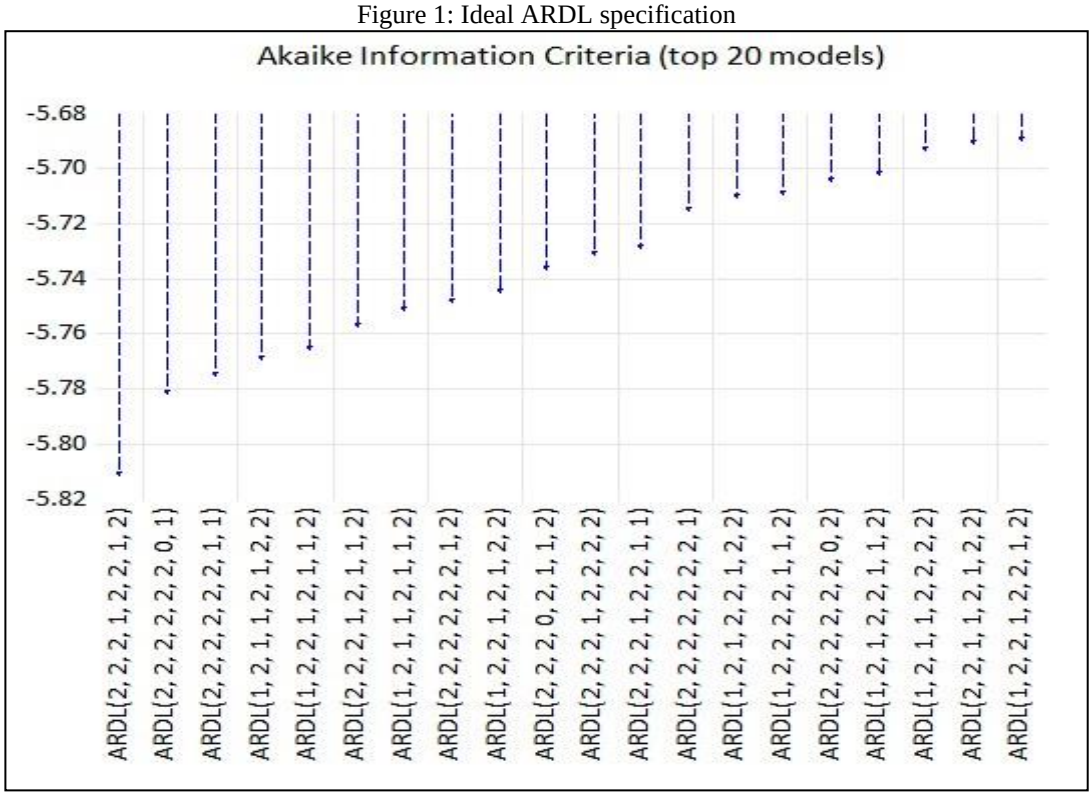
APPENDICES

Figure 1: Ideal ARDL specification



Source: Prepared by the authors (2023).