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Research Article/Araştırma Makalesi

The Course of Tax Revenue During the Process of Population Aging: Empirical Evidence from Turkey

Nüfusun Yaşlanma Sürecinde Vergi Hasılatının Seyri: Türkiye'den Ampirik Kanıtlar

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Abstract

Societies undergo continuous socio-economic transformations. One such significant change is the aging of the population, which carries substantial economic and social implications. This study examines the impact of population aging on tax revenues in Turkey, utilizing data spanning from 1971 to 2020. The ARDL cointegration analysis and the FMOLS long-term cointegration estimator were employed for the research. Contrary to the prevailing literature, the analysis results indicate a positive correlation between aging and tax revenue. Specifically, a 1% rise in the median age leads to a 2.71% increase in the share of tax revenues as a percentage of GDP.

Jel Codes: *H55, J11, J26*
Keywords: *Aging Population, Tax Revenue, Turkey, ARDL, FMOLS*

Öz

Toplumlar sosyoekonomik olarak sürekli bir değişim içerisindedir. Toplum nüfusunun yaşlanması da bu değişimlerden önemli bir tanesidir. Bu değişimin önemli ekonomik ve sosyal sonuçları olmaktadır. Çalışmada 1971 ve 2020 yılları arasını kapsayan veriler kullanılarak Türkiye'de nüfusun yaşlanmasının vergi hasılatı üzerindeki etkisi test edilmektedir. Çalışmada ARDL eşbütünleşme analizi ve FMOLS uzun dönemli eşbütünleşme tahmincisi kullanılmıştır. Analiz sonucuna göre genel literatürün aksine yaşlanma ile vergi hasılatı arasında pozitif ilişki bulunmuştur. Medyan yaşta meydana gelen %1'lik bir artış GSYH içerisindeki vergi gelirlerinin payını %2,71 oranında artırmaktadır.

Jel Kodları: *H55, J11, J26*
Anahtar Kelimeler: *Nüfus Yaşlanması, Vergi Geliri, Türkiye, ARDL, FMOLS*

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1. Introduction

As Tolkien said, "*the world is changing*" (2004: 1285), and with these changes come evolving demographic trends and shifting population projections. In light of these demographic shifts, it becomes evident that policy recommendations need formulation and strategies need preparation for forthcoming periods. In societies experiencing consistent population growth, the demand for public services inevitably escalates. The age distribution of the population dictates the nature and focus of these public services. For instance, societies with a predominantly young population will witness a surge in demand for educational services. In contrast, where the elderly population is more significant, an expansion of health services becomes paramount, subsequently intensifying the strain on social security institutions.

Conversely, as the elderly population exits the workforce, opportunities arise for the younger generation. In a robust economy, the turnover of labor departing from production is expedient. A youthful population plays a pivotal role in this context. The sustained provision of both physical and intellectual labor essential for production is ensured by this young demographic. An aging society hampers the labor supply. Hence, it's crucial to scrutinize demographic shifts that indicate an aging population trend.

Addressing the challenges of a population's aging process significantly rests upon the state. As the needs of an aging population evolve, public authorities emerge as the principal service providers to cater to these needs. To deliver these services, the state must harness revenues, primarily through means like taxation. Recognizing the impact of societal transformation on tax contributions is vital. If the collective tax effort wanes, the delivery of public services may be compromised.

The primary research question of this study pertains to the attitude towards taxation amid the aging trajectory of Turkish society. Determining whether an aging society contributes more or less in taxes will be pivotal for shaping policy recommendations in forthcoming periods. While there are past studies grounded on surveys addressing this issue, none have ventured into an empirical examination in a broader macro context. In this research, an empirical model is devised to address the core research question, drawing upon socioeconomic factors that influence tax contributions. This research bridges a significant gap in the existing literature by offering an empirical, macro-level investigation of the relationship between aging demographics and tax revenues in Turkey. Its unique value is derived from the meticulous fusion of demographic studies with fiscal analysis, a dimension under-explored in prior research.

For model selection, the ARDL cointegration test was employed, taking into account the stationarity of the series. Upon establishing a cointegration relationship, the FMOLS cointegration estimator was utilized to ascertain the direction and magnitude of the long-term relationship. While numerous factors might influence voluntary tax compliance, only those quantifiable were incorporated. A potential critique of the model lies in the reality that society's members do not possess uniform income and wealth, and consumption and saving habits differ. Notwithstanding this limitation, the model yields insightful findings and is

valuable for policy formulation. Based on the model's outcomes, an uptick in Turkey's average age elevates the tax share within its GDP.

Initially, the study delves into the conceptual framework concerning the elderly, its primary target group. This provides clear differentiation between the terms "*elderly*", "*old age*", and "*aging*" which are often used synonymously. The study then evaluates the demographic shift towards an aging population, an issue poised to become a global concern. It examines the present state and forecasts based on population projections about aging, both globally and in Turkey. This section presents basic statistics reflecting the status of the elderly in Turkey. Having established the broader context about the elderly, the research then explores the nexus between old age and taxation. The connection between old age and taxes, specifically in the Turkish context, is analyzed through the proposed model. The conclusion offers an overarching evaluation of the model's findings.

2. Conceptual Framework: Aging and Old Age

Historically, societies have categorized individuals by age, ascribing them distinct statuses. Infants and children, representing the future generation, have been cherished and valued but seldom elevated in societal rank. Young and middle-aged individuals, critical to the economic and social fabric of society, play an essential role in its continuity. Yet, in terms of societal hierarchy, even with their contributions, they've not typically occupied the upper tiers. In contrast, the elderly have often been accorded a more elevated status in social life. Their accumulated life experiences and achievements have garnered them respect and reverence, as evident in the significance given to their insights (Achenbaum, 2002: 561). Still, based on regional and cultural variances, there exist instances of less favorable treatments towards the elderly. In certain traditional societies, the elderly have been viewed as liabilities, sidelined, or even left to their fate (Simmons, 1945: 226-227). Hence, historical perspectives on the elderly have oscillated between esteeming them within the social order and regarding them as encumbrances. However, advancements in human rights standards, the impact of gerontological research, and heightened awareness for vulnerable demographics have curtailed practices that negatively stereotype or ostracize the elderly. Today, the elderly are safeguarded within the social security framework, recognized as active citizens engaged in various facets of societal life.

While there's a broad consensus regarding perceptions of the elderly, the same clarity doesn't extend to terms associated with old age. The interchangeable use of "*elderly*", "*aging*", and "*old age*" introduces ambiguity into the conceptual framework surrounding old age. Thus, it's crucial to initially discern the nuances and distinct meanings of these terms. The term "*elderly*" acts as a descriptive adjective, whereas "*aging*" describes a process. This aging journey, culminating in the status of being "*elderly*", spans physiological, psychological, and sociological facets (Tufan, 2016: 4). In contrast, "*old age*" designates a life stage that commences after a specific age threshold. In this context, while aging represents an ongoing transformation, old age is its culmination. This phase signifies the concluding stage of human life, marked by physiological and psychological shifts (Arslan, 2015: 67). Health challenges manifesting at the

twilight of the aging trajectory, physical vulnerability, memory lapses, diminished productivity, and subsequently frayed social ties define the epoch of old age (Tufan, 2016: 4).

Like all concepts, the ideas surrounding aging and old age evolve in response to societal shifts. Changes in factors such as total population, demographic structure, anticipated life expectancy, mortality rates, and population growth rates call for updates in how these notions are defined. Crucially, economic and social policies require recalibration to reflect these shifts. Furthermore, old age is a multifaceted topic touched upon by multiple disciplines. Research pertaining to this theme spans diverse fields like psychology, medicine, economics, and sociology, and perspectives on the concepts might differ based on the discipline's nature. There are varied perspectives on aging corresponding to how old age is approached: Chronological, biological (physiological), psychological, social, and economic aging (Canatan, 2008: 16). Each of these perspectives, often referred to as types of aging, underscores a specific facet of the aging process.

Chronological aging is determined from the date of birth and adheres to a calendar timeline. It's the form of aging recognized in official contexts. Such aging is factored into determinations like the legal age for marriage or voting. The onset of the phase termed "old age" is also defined in this manner (Canatan, 2008:16). Biological aging pertains to external physical appearances and the functionality of the body. Manifestations such as skin wrinkles and diminishing organ functions signify this type of aging (Rockstein & Sussman, 1979: 9). Psychological aging unfolds from the accumulation of an individual's life experiences. It encompasses the maturing of the mind as it becomes densely populated with memories over dreams. Essentially, when one's thoughts lean more towards past recollections than future aspirations, psychological aging is evident. Social aging pertains to the evolution of an individual's interpersonal relationships, family dynamics, professional life, and their adaptive responses to environmental shifts (Gruca & Schewe, 1992: 18).

Economic aging pertains to the gradual decline in the value an individual can generate as their capacity to work diminishes with age. Under this form of aging, an individual's earnings diminish in tandem with their dwindling productive capabilities (Canatan, 2008: 16). They may come to rely more on retirement pensions, and with escalating health-related expenses or other unforeseen costs, they might encounter financial challenges. This scenario not only underscores a decrease in the individual's capacity to yield economic value but also incrementally curtails their contribution to tax collections. From a societal vantage point, a surge in public spending becomes inevitable as elderly individuals grow more reliant on supportive care. This arises because these individuals no longer contribute to social security premiums due to their exit from the workforce, frequently utilize health services attributed to age-related ailments, and necessitate fiscal provisions like retirement pensions.

3. Aging Population in Turkey and the World

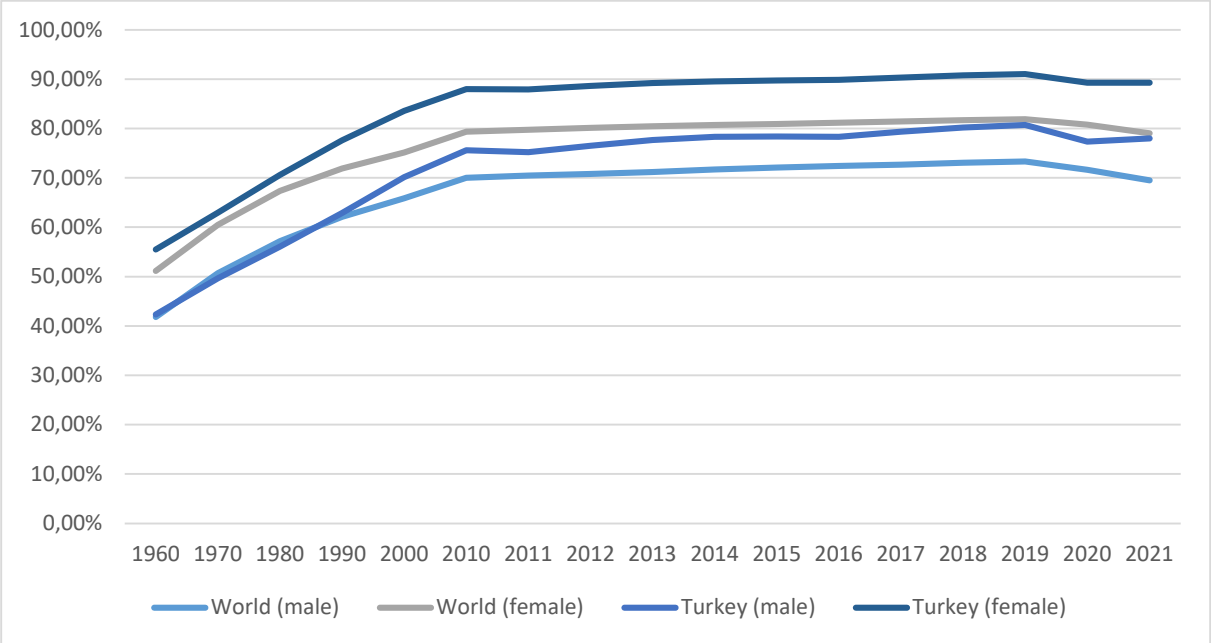
While aging manifests micro effects on individual lives, the aging of the broader population brings about macro implications for societal life on a global scale. Through the lens of the basic needs approach, the provision of core health services, bolstered by technological and scientific

advancements, typically leads to prolonged average lifespans. As advancements in science and technology enhance and diversify treatment options, higher education levels uplift individuals' quality of life and choices. Elevated standards of nutrition and hygiene, coupled with improved living conditions, reduce mortality rates and extend life expectancy. Nonetheless, due to urbanization and the proliferation of wage labor across genders, the population growth rate generally shows a decline, albeit pronounced in specific regions (Salvati et al., 2019: 2). This trend brings the issue of aging to the forefront of economic policies globally (Lee et al., 2010).

3.1. Aging Trend of the Population in the World and Turkey

The human life cycle primarily progresses through the stages of birth, aging, and death. Analyzing this cycle within societies aids in forecasting population structural changes. Both births and deaths are crucial for maintaining a socioeconomically balanced society. A surge in the elderly population within a society could jeopardize its economic and social equilibrium, underscoring the necessity of death for societal well-being. Below, Graphic 1 illustrates the survival rates of the elderly population globally and in Turkey, differentiated by gender.

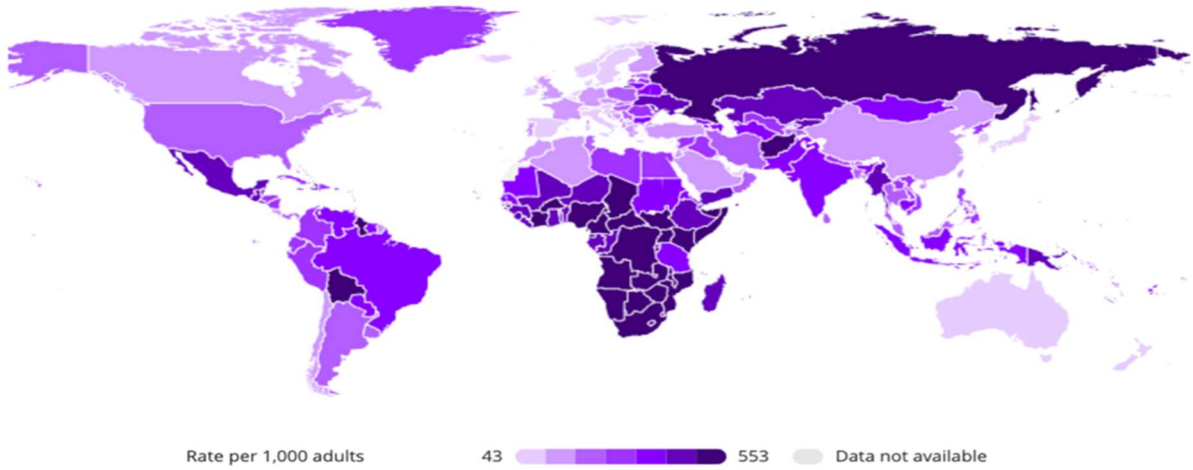
Graphic 1: Survival Rate of the Elderly Population by Gender in the World and Turkey (%, age 65+)



Source: World Bank, 2023.

As illustrated in Graphic 1, the survival rates of the elderly have been on the rise since the 1980s, stabilizing at distinct levels in the 2000s. The noticeable dip post-2019 is likely attributable to the global Covid-19 pandemic. Generally, elderly females exhibit higher survival rates than their male counterparts. However, the global average for both genders remains lower than Turkey's average. This global average decline is impacted by the elevated mortality rate among the elderly in certain regions, notably in Africa. Figures 1 and 2 below shed light on these regional disparities by showcasing the death rate among adults.

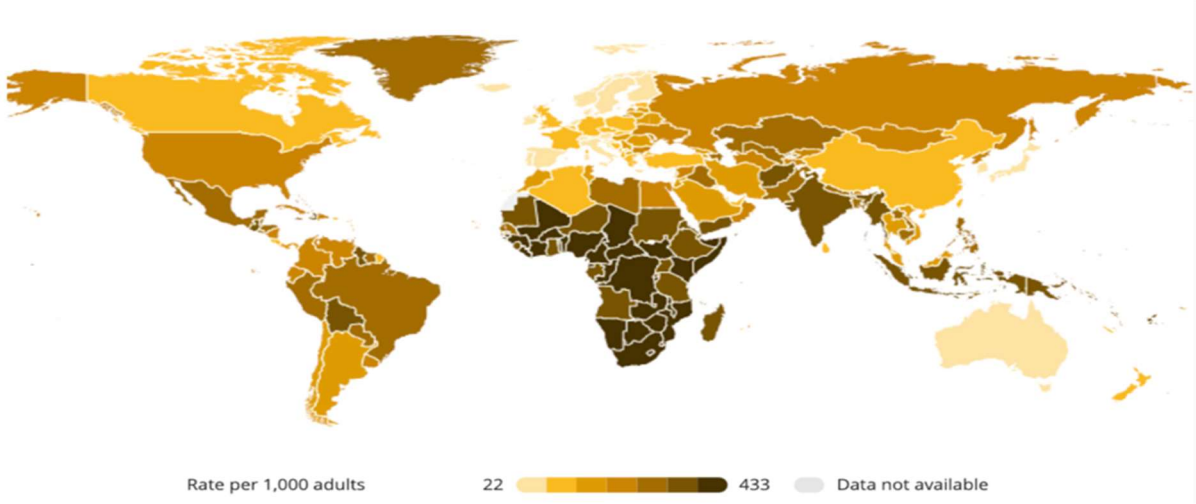
Figure 1: Male Adult Death Rate (per 1000 adults, age 15-60)



Source: World Bank, 2023.

Figure 1, sourced from the World Bank, illustrates the probability of death for the adult population aged 15-60. Regionally, there's significant variation in the adult male death rate. While Northern Europe and Australia see a decline in the probability of death among men, it increases in Sub-Saharan Africa and Russia. In Latin America, notably in Bolivia and Guyana, the likelihood of male death exceeds the regional average. Figure 2 showcases the probability of death among adult females.

Figure 2: Female Adult Death Rate (per 1000 adults, age 15-60)

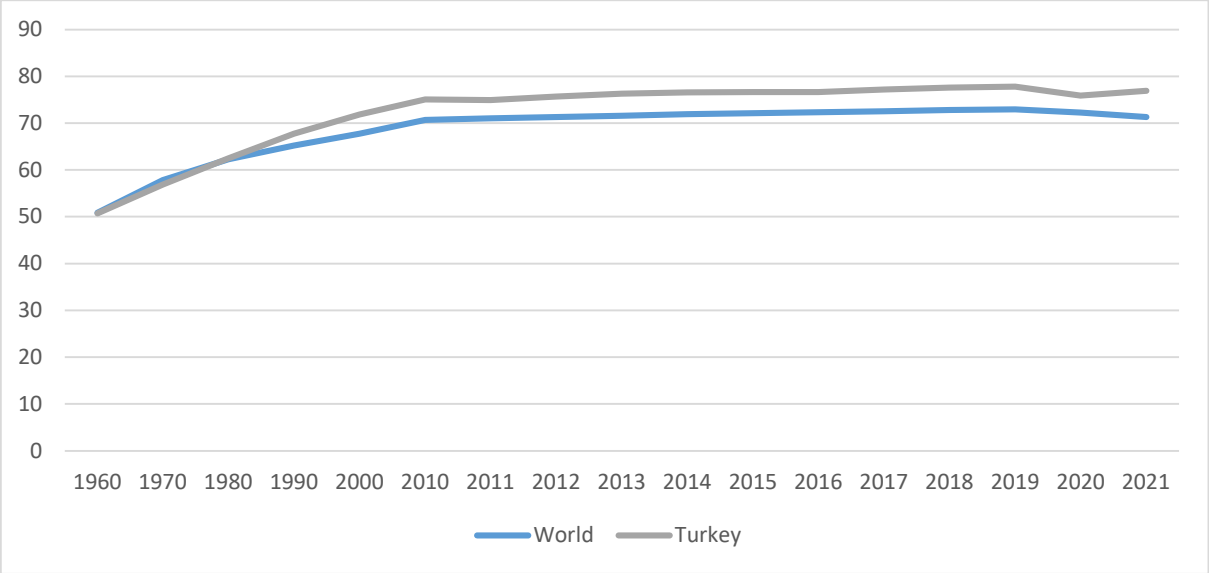


Source: World Bank, 2023.

As highlighted in Figure 2, the probability of death among adult females also varies. Nonetheless, regional discrepancies in male and female death probabilities can be distinct. Northern Europe and Australia continue to rank as regions with the lowest probability of adult female death. The highest likelihood of death among adult females is seen in Sub-Saharan Africa. In areas like Russia, Bolivia, and Guyana, where the male death rate is elevated, the probability of death for females tends to be lower than for males.

Considering the data on death rates and elderly survival, coupled with the rise in life expectancy at birth, there's a discernible trend of an aging population. Life expectancy at birth offers an estimate of the projected lifespan of a baby born at that time, given the prevailing conditions. Graphic 2 presents the life expectancy at birth for both the global population and Turkey.

Graphic 2: Life Expectancy at Birth (Years)

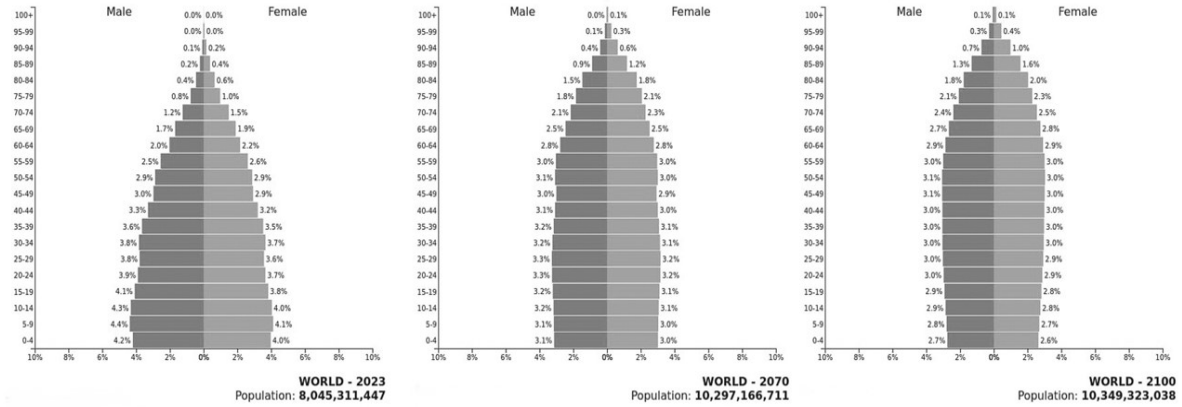


Source: World Bank, 2023.

Graphic 2 underscores the increased probability of survival among the elderly. After a swift ascent in the 1980s, life expectancy at birth has remained relatively stable since 2010. The 2010s witnessed minor fluctuations, with a modest decline post-2019. This drop, likely influenced by the Covid-19 pandemic, hasn't led to a fundamental shift. Since the 1980s, life expectancy at birth in Turkey has consistently surpassed the global average. While the global life expectancy average lingers slightly above 70, Turkey's approaches the 80s.

In conclusion, the demographic structure both worldwide and in Turkey is unmistakably trending towards aging. As per population projections from the United Nations, by 2070, individuals aged 65 and over are anticipated to outnumber those in the 0-14 age bracket (United Nations, 2023). The shifts in global demographics are lucidly represented in Figure 3's population projections.

Figure 3: Population Pyramids for 2023, 2070, and 2100 (World)



Source: Population Pyramid, 2023.

Figure 3 displays population pyramids for 2023 and forecasts for 2070 and 2100. The 2023 pyramid shows a broad base, signifying a substantial younger population. However, future predictions depict this base gradually diminishing. By 2070, there's a marked rise in the 50-54 age bracket and older. Come 2100, the pyramid emphasizes populations in the 20-24 and 55-59 age ranges, suggesting that over time, the global population structure might invert. Hence, the elderly are poised to gain greater prominence in future national and international policy dialogues. This underscores the imperative for nations to adapt their economic strategies to accommodate an aging populace and prudently modulate their extant socioeconomic frameworks to fortify their economies.

3.2. Trend of Aging in the Demographic Structure of Turkey

Turkey is not immune to the global trend of aging. Table 1 presents the total and elderly population over various years, along with projections up to 2080. Drawing on current conditions and anticipated future trends, a population estimate for 2080 has been formulated. A glance at Table 1 reveals that the proportion of the elderly within the overall population is climbing, a trend anticipated to persist.

Table 1: Turkey's Total and Elderly Population (65+ years) by Year

Year	Total Population			Elderly Population		
	Total	Male	Female	Total	Male	Female
1935	16 158 018	7 936 770	8 221 248	628 041	278 846	349 195
1940	17 820 950	8 898 912	8 922 038	629 859	271 421	358 438
1945	18 790 174	9 446 580	9 343 594	626 543	256 683	369 860
1950	20 947 188	10 527 085	10 420 103	690 662	272 760	417 902
1955	24 064 763	12 233 421	11 831 342	822 408	320 704	501 704
1960	27 754 820	14 163 888	13 590 932	978 732	388 087	590 645
1965	31 391 421	15 996 964	15 394 457	1 242 525	530 004	712 521
1970	35 605 176	18 006 986	17 598 190	1 565 696	707 807	857 889
1975	40 347 719	20 744 730	19 602 989	1 853 251	850 652	1 002 599
1980	44 736 957	22 695 362	22 041 595	2 113 247	955 360	1 157 887
1985	50 664 458	25 671 975	24 992 483	2 125 908	955 042	1 170 866
1990	56 473 035	28 607 047	27 865 988	2 417 363	1 091 142	1 326 221
2000	64 729 501	32 398 849	32 330 652	4 350 190	1 887 904	2 462 286
2005	68 860 539	34 490 906	34 369 633	4 646 742	2 010 667	2 636 075
2007	70 586 256	35 362 233	35 224 023	4 865 416	2 096 122	2 769 294
2008	71 517 100	35 901 154	35 615 946	4 893 423	2 139 481	2 753 942
2009	72 561 312	36 462 470	36 098 842	5 083 414	2 222 764	2 860 650
2010	73 722 988	37 043 182	36 679 806	5 327 736	2 331 029	2 996 707
2011	74 724 269	37 532 954	37 191 315	5 490 715	2 397 925	3 092 790
2012	75 627 384	37 956 168	37 671 216	5 682 003	2 473 913	3 208 090
2013	76 667 864	38 473 360	38 194 504	5 891 694	2 561 074	3 330 620
2014	77 695 904	38 984 302	38 711 602	6 192 962	2 699 423	3 493 539
2015	78 741 053	39 511 191	39 229 862	6 495 239	2 843 442	3 651 797
2016	79 814 871	40 043 650	39 771 221	6 651 503	2 919 392	3 732 111
2017	80 810 525	40 535 135	40 275 390	6 895 385	3 033 433	3 861 952
2018	82 003 882	41 139 980	40 863 902	7 186 204	3 170 132	4 016 072
2019	83 154 997	41 721 136	41 433 861	7 550 727	3 337 260	4 213 467
2020	83 614 362	41 915 985	41 698 377	7 953 555	3 513 892	4 439 663
2021	84 680 273	42 428 101	42 252 172	8 245 124	3 654 709	4 590 415
2022	85 279 553	42 704 112	42 575 441	8 451 669	3 750 248	4 701 421
2023*	86 907 367	43 550 799	43 356 568	8 867 951	3 964 105	4 903 845
2030*	93 328 574	46 701 041	46 627 533	12 066 092	5 459 819	6 606 272
2040*	100 331 233	50 062 203	50 269 030	16 373 971	7 451 781	8 922 190
2060*	107 095 998	53 151 438	53 944 560	24 242 787	11 024 497	13 218 290
2080*	107 100 904	53 103 777	53 997 126	27 413 359	12 556 365	14 856 994

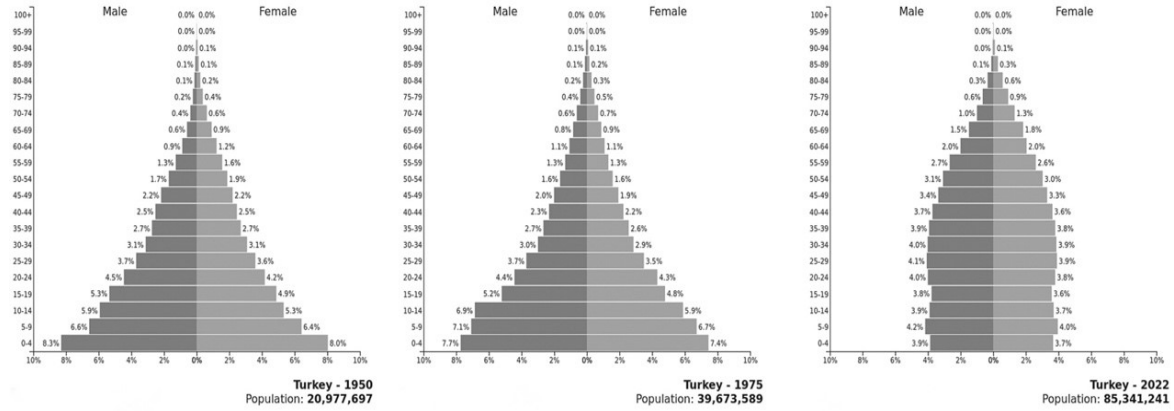
Source: TurkStat, 2023. * Due to rounding, the figures in the table may not add up to the total.

Table 1 indicates that in 1975, the population stood at roughly 40.3 million. By 2017, this number had soared, doubling to exceed 80 million. In a span of about 40 years, Turkey's population doubled, with projections suggesting a figure of 107.1 million by 2080. This anticipated rise of around 30% over just over six decades aligns with the global narrative of a marked deceleration in the population growth rate. In terms of the elderly demographic, a

pronounced surge is foreseen. From a count of 6.9 million in 2017, the elderly populace is projected to escalate, tripling to 27.4 million by 2080. This marked growth in the elderly bracket resonates with the worldwide trend towards aging.

The population pyramids in Figure 4 vividly illustrate the demographic shift towards aging in Turkey. A broad base and a tapered apex of the pyramid signify a predominantly youthful population. As the base contracts and the apex expands, it signals an aging populace. Analyzing Figure 4, which encompasses population pyramids for 1950, 1975, and 2022, one can deduce that over the years, there's been a decline in the youth cohort, a concentration in the middle-aged segment, and a swell in the group aged 60 and above.

Figure 4: Population Pyramids for 1950, 1975, and 2022 (Turkey)



Source: Population Pyramid, 2023.

In Figure 4, Turkey's demographic structure in 1950 appears youthful. The broadest base signifies a young society, pointing to the rise of a younger generation. By contrast, the 2022 population pyramid showcases a wider base and narrower upper tier, suggesting a predominantly young populace. However, the gradual narrowing of the lower sections combined with the expansion of the upper tiers indicates a societal shift towards aging. Using this as a reference, Turkey's demographic structure can be deemed relatively young. Nonetheless, the slower narrowing of the pyramid's sections post-age 60 signals the onset of an aging population in Turkey. Compared to the 1950 pyramid, the demographic shift is clear. In 1950, the 0-4 age group was prominently wide, but by 2022, the sections representing ages 20-24 and 45-49 have broadened noticeably. Moreover, 2022 sees a significant expansion in the segments denoting ages 60 and above.

Table 2 illustrates the distribution of the elderly population by gender and their proportion in the overall population. As Table 2 displays, the elderly accounted for merely 3.5% of the total populace in 1935. This ratio has grown substantially over the decades. Projections suggest that the elderly will represent an increasingly substantial portion of Turkey's population. By 2080, it's anticipated that 1 in every 4 individuals will be in the elderly age bracket.

Table 2: Proportion of Elderly Population to Total Population by Year and Gender Ratio of Elderly Population (%, 65+ years)

Year	Proportion of Elderly in Total Population		Gender Ratio	
	Male	Female	Overall Gender Rate	Elderly Gender Ratio
1935	3.5	4.2	96.5	79.9
1940	3.1	4.0	99.7	75.7
1945	2.7	4.0	101.1	69.4
1950	2.6	4.0	101.0	65.3
1955	2.6	4.2	103.4	63.9
1960	2.7	4.3	104.2	65.7
1965	3.3	4.6	103.9	74.4
1970	3.9	4.9	102.3	82.5
1975	4.1	5.1	105.8	84.8
1980	4.2	5.3	103.0	82.5
1985	3.7	4.7	102.7	81.6
1990	3.8	4.8	102.7	82.3
2000	5.8	7.6	100.2	76.7
2005	5.8	7.7	100.4	76.3
2007	5.9	7.9	100.4	75.7
2008	6.0	7.7	100.8	77.7
2009	6.1	7.9	101.0	77.7
2010	6.3	8.2	101.0	77.8
2011	6.4	8.3	100.9	77.5
2012	6.5	8.5	100.8	77.1
2013	6.7	8.7	100.7	76.9
2014	6.9	9.0	100.7	77.3
2015	7.2	9.3	100.7	77.9
2016	7.3	9.4	100.7	78.2
2017	7.5	9.6	100.6	78.5
2018	7,7	9,8	100,7	78,9
2019	8,0	10,2	100,7	79,2
2020	8,4	10,6	100,5	79,1
2021	8,6	10,9	100,4	79,6
2022	8,8	11,0	100,3	79,8
2023*	9.1	11.3	100.4	80.8
2030*	11.7	14.2	100.2	82.6
2040*	14.9	17.7	99.6	83.5
2060*	20.7	24.5	98.5	83.4
2080*	23.6	27.5	98.3	84.5

Source: TurkStat, 2023. **Note:** The gender ratio is determined by comparing the male population to the female population (male population/female population). * Due to rounding, the figures in the table may not add up to the total.

An examination of Turkey's elderly population distribution by gender reveals that women consistently account for a larger proportion. The gender ratio is projected to hit 84.5% by 2080. This suggests that there will be a greater number of elderly women compared to elderly men, reflecting the typically shorter life expectancies of men compared to women.

The aging of the population profoundly impacts social dynamics and economic infrastructure. One of the most significant consequences is a reduced participation in economic activities. Economic aging is a phenomenon where individuals' economic productivity diminishes, often leading to emotional challenges. Someone who has been engaged in active work for an extended period might eventually exit the production cycle due to reasons such as retirement (Canatan, 2008: 108).

The inevitable decline in productivity as individuals age is a reality. Elderly individuals, particularly those not physically primed for economic tasks, tire quickly, find it challenging to adapt to new work environments, and may struggle to stay abreast of technological changes. Consequently, it's hardly surprising that many businesses are hesitant to hire older workers. Additionally, given their physical or psychological limitations, many elderly individuals might not wish to participate actively in the labor market.

The decline in productivity due to aging is a natural progression. Elderly individuals, often not physically suited for demanding economic tasks, tend to tire more quickly, adapt at a slower rate to novel work environments, and may find it challenging to keep up with rapid technological shifts. Given these factors, it's understandable why many businesses hesitate to hire older employees. When considering their physical constraints and potential psychological reservations, a significant number of elderly individuals might opt to have limited engagement in the workforce.

Table 3: Labor Force Participation Statistics of the Elderly Population (%, 65+ years)

	2018			2019			2020		
Elderly Population	Total	Male	Female	Total	Male	Female	Total	Male	Female
Participation Rate	12,5	20,9	5,9	12,0	20,1	5,6	10,0	16,8	4,6
Employment Rate	12,1	20,2	5,8	11,6	19,4	5,5	9,7	16,2	4,6
Unemployment Rate	2,7	3,2	1,4	3,1	3,6	1,7	2,7	3,3	1,2
Distribution of Employed by Sector									
Agriculture	65,5	63,1	72,1	64,7	62,6	71,1	64,2	62,5	69,2
Industry	4,7	5,0	4,0	5,3	5,6	4,0	6,1	7,0	3,5
Construction	2,5	3,4	-	1,9	2,6	-	2,0	2,7	0,5
Services	27,3	28,5	23,9	28,1	29,2	24,9	27,7	27,8	26,8

Source: TurkStat, 2023.

When examining the sectors where the elderly are predominantly employed, agriculture emerges at the forefront. As anticipated, older individuals are more commonly employed in agriculture, a sector rooted in traditional methods, as opposed to sectors like industry and services, which are heavily influenced by technology. That being said, as the elderly adapt to

society's evolving landscape, they are finding increasing opportunities in the service sector. The proportion of elderly workers in the service sector grew from 27.3% in 2018 to 27.7% in 2020. Similarly, employment rates in the agricultural sector have also seen an uptick.

Another significant consideration regarding the participation of the elderly in economic activities and their societal impact is their educational attainment. A rise in individuals' education levels not only benefits them directly but also fosters a society enriched by the positive externalities of a more educated populace. Table 4 presents the distribution and percentages of the elderly population segmented by their level of education.

Table 4: Distribution and Rate of Elderly Population by Education Level (65+ years)

Education Level	2015	2016	2017	2018	2019	2020	2021
Distribution of Elderly Population by Education Level							
Illiterate	1 395 239	1 355 583	1 322 367	1 286 278	1 246 533	1 208 047	1 156 508
Literate but Did Not Finish Any School	1 202 319	1 188 333	1 183 750	1 181 795	1 167 901	1 159 396	1 133 602
Primary School Graduate	2 739 544	2 851 392	3 005 849	3 165 195	3 350 476	3 574 342	3 722 836
Middle School or Equivalent/Elementary School Graduate	332 394	365 740	404 119	457 206	536 223	615 660	684 760
High School or Equivalent Graduate	353 525	385 298	426 695	474 614	550 151	621 513	686 169
Higher Education	343 839	377 783	417 674	462 187	514 092	575 844	630 551
Total Population	**6 366 860**	**6 524 129**	**6 760 454**	**7 027 275**	**7 365 376**	**7 754 802**	**8 014 426**
Distribution Rate by Education Level							
Illiterate	21.9	20.8	19,6	18,3	16,9	15,6	14,4
Literate but Did Not Finish Any School	18.9	18.2	17,5	16,8	15,9	15,0	14,1
Primary School Graduate	43.0	43.7	44,5	45,0	45,5	46,1	46,5
Middle School or Equivalent/Elementary School Graduate	5.2	5.6	6,0	6,5	7,3	7,9	8,5
High School or Equivalent Graduate	5.6	5.9	6,3	6,8	7,5	8,0	8,6
Higher Education	5.4	5.8	6,2	6,6	7,0	7,4	7,9
Total (%)	**100.0**	**100.0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: TurkStat, 2023.

As illustrated in Table 4, the percentage of elderly individuals with higher education degrees was 5.4% in 2015. By 2020, this rate had climbed to 7.4%. This represents an increase of roughly 37% over a span of five years. Concurrently, the proportion of those who completed high school or its equivalent has also risen. It's evident that the educational attainment of the elderly population has generally been on an upward trajectory over the years.

This elevation in education levels indicates a shift in labor from being predominantly physical to becoming increasingly cognitive. In this context, a higher level of education can also extend the period an individual remains active within the workforce. The contributions of an educated populace to production are augmented both in volume and quality. When someone is excluded from the production process, their income significantly diminishes, leading to entrenched poverty among the elderly. Nevertheless, the poverty rate among the elderly is also influenced by the efficiency and reach of the social security and aid system. Table 5 displays the poverty rate among the elderly, segmented by gender.

Table 5: Poverty Rate of Population by Gender and Age (%)

		2015	2016	2017	2018	2019	2020
Total	Total	21.9	21.2	20,1	21,2	21,3	21,9
	Elderly (65+)	**18.3**	**16.0**	**15,5**	**16,4**	**14,2**	**16,7**
Male	Total	22.2	22.0	21.4	21.7	20.8	19,6
	Elderly (65+)	**17.7**	**17.4**	**18.3**	**17.8**	**14.7**	**13,5**
Female	Total	22.9	22.8	22.2	22.0	21.6	20,7
	Elderly (65+)	**19.4**	**18.2**	**18.2**	**18.6**	**17.0**	**17,0**

Source: Compiled from TurkStat (2023) statistics.

According to Table 5, which presents the poverty rates for both the general population and the elderly from 2015 to 2020, 18.3% of the elderly were living in poverty in 2015. This rate decreased to 16.7% by 2020. Notably, the poverty rate among the elderly is marginally lower than the overall societal poverty rate. When segmented by gender, the data reveals that elderly women experience higher poverty rates than their male counterparts. This disparity primarily stems from societal gender norms which result in lower workforce participation rates among women. Due to patriarchal obstacles, many women face challenges accessing paid employment, thus excluding them from social security benefits based on premium payments in their later years. The insufficient social protection and support for women who are unable to access the retirement system, combined with a decreasing public role in social spending, makes elderly women particularly susceptible to poverty.

4. The Relationship Between Aging and Tax

States have an intrinsic need to incur expenses to sustain their operations and provide public services. To finance these activities, they must generate revenue. The avenues to raise this revenue are restricted, and certain strategies, such as printing money or excessive borrowing, can induce long-term macroeconomic challenges. To circumvent these issues, the most viable approach for states is to derive income from taxes. By adopting this method, those who avail

themselves of the public services will shoulder the associated costs, ensuring that, provided extreme actions are avoided, macroeconomic stability is preserved (Akalın, 2000: 309).

The financial obligations arising from state expenditures create a tax burden on society. According to Article 73 of the Constitution, every citizen must contribute to this burden in proportion to their financial capability. The onus of ensuring an equitable distribution of this burden falls on the government. Individuals address this obligation in various ways: by willingly or reluctantly making payments or by seeking legal or illicit means to evade them. The state aims to minimize non-compliance and incentivize citizens to fulfill their tax obligations. The ideal scenario for the government is to make these payments voluntarily, without coercion.

When it comes to tax collection, certain metrics are paramount. Accurate forecasting and fulfillment of these forecasts facilitate sound budgeting and the effective provision of public services. The combined financial capability within society at any particular time defines the overall tax capacity. Precise determination of this tax capacity is essential. The anticipated tax capacity, and the consequent amount aimed to be collected based on this estimation, equates to the tax effort. Tax effort describes the proportional relationship between the predicted tax capacity and the realized tax capacity (Akdoğan, 2011: 185-186). Given that a heightened tax effort directly correlates with increased tax revenues, governments are keen to boost tax effort.

Several factors influence the increase in tax capacity, including the effectiveness of tax administration, tax legislation, fiscal judiciary, and individuals' attitudes. For a tax system to achieve financial success and boost tax effort, it's essential to elevate taxpayers' tax morale and compliance levels. Put differently, taxpayers should have a positive disposition towards taxes. However, since taxes are characterized as mandatory and non-refundable payments, they are often perceived as burdensome.

Various elements shape taxpayers' perceptions of taxes. These elements can stem from a country's social, political, economic, and fiscal dynamics, as well as from the individual characteristics of the taxpayer. Aspects such as age, gender, marital status, profession, income level, and overall economic standing significantly influence an individual's attitude towards taxes.

An individual's age significantly influences their behavior and how they exhibit it. As one ages, life experiences and the knowledge derived from them shape their perspective, which, in turn, impacts their present and future actions. Young taxpayers, often due to their economic position, tend to have higher consumption tendencies and might exhibit more audacious attitudes in the pursuit of future economic prosperity. Conversely, older taxpayers tend to be less adventurous and ambitious about enhancing their standard of living. From this viewpoint, it can be argued that the elderly might exhibit a higher level of tax compliance compared to younger individuals (Gökbunar et al., 2007: 78).

Several studies suggest that as people age, their tax compliance improves (Torgler, 2006: 88). As tax compliance grows, the perception of tax as a burdensome obligation diminishes,

facilitating an increase in tax effort. Table 6 consolidates various studies and their findings on the relationship between aging and tax attitudes.

The aging population has profound implications for public finances. This societal shift significantly impacts public revenues, expenditures, borrowing, and, consequently, the budget balance. There is extensive literature on this topic. The influence of aging on public finances is explored through these projections.

Table 6: Studies on the Relationship Between Aging and Tax

Author	Scope	Result
Vogel (1974)	Sweden	A positive relationship has been found between age and taxation. It has been concluded that older people are less inclined to evade taxes compared to younger individuals.
Torgler (2004)	Asian Countries	The study concluded that as individuals' age increases, their tax morale also increases.
Okamoto (2005)	Japan	As a result of the simulation made in the study, shifting the taxes from the labor base to the spending base with an increasing rate will be more effective in preventing the negative effects that will arise as a result of the aging of the population.
Torgler (2006)	30 Countries	The study found that as age progresses, tax morale and therefore tax compliance gradually increase.
Gökbunar et al. (2007)	Turkey	The study found that older people are more sensitive to sanction threats, hence there's a direct correlation between old age and tax morale as well as tax compliance.
Okamoto (2007)	Japan	The study includes a proposal for the optimal tax composition for the Japanese economy, based on the aging Japanese society. It proposes lowering taxes on interest income by increasing consumption taxes.
Çelikkaya & Gürbüz (2008)	Eskisehir	It has been concluded that as the level of old age increases, there's opposition to tax amnesties and being a regular taxpayer is favored.
Martinez-Vazquez & Torgler (2009)	Spain	The study concluded that as individuals' age increases, there is also an increase in their tax morale.
İpek & Kaynar (2009)	Canakkale	According to the study, contrary to the progression of age, tax morale and tax compliance have been found to decrease.
Creedy et al. (2010)	New Zealand	According to the study, labor force participation decreases and wages increase due to low fertility. This affects people's retirement decisions. The high saving rate of the elderly population also falsifies the proposition that tax revenues will always decrease with old age.
Sriyana (2011)	Indonesia	According to the results of the study, as a result of the aging of the population, tax revenues decrease and the pressure on public finances increases.
Mutlu & Taşçı (2013)	Malatya	It has been concluded that the increase in the level of old age negatively affects tax compliance.

Can & Duran (2015)	Istanbul	The survey found that among demographic factors, gender and professional status have an influence on tax morale. However, age, education, and marital status were not identified as factors affecting tax morale.
Braun & Joines (2015)	Japan	According to the results of the study, it is stated that if no reform is made in the financial system, the consumption tax rate should be increased to 37% in order to eliminate the pressure caused by the aging of the population.
Kudrna et al. (2015)	Australia	The study revealed that the aging of the population shifts taxes from labor to the base of consumption and wealth taxes. It has been concluded that the government's aging-related expenses have also increased significantly.
Tatlı & Göçer (2015)	Turkey	According to the results of the analysis in the study, it was found that the social security policies in Turkey are sustainable in a weak form. It has been found that approximately 70% of the social security expenditures in the 1989-2013 period and 78% in the 2007-2014 period can be met by the incomes of the social security institution. In recent years, there has been a slight improvement in the sustainability of the social security system.
Chen (2016)	55 Developing and Developed Country	The study argues that the widely held view that population aging tends to increase budget deficits is theoretically consistent. However, preliminary results estimated over 55 developed and developing countries from 1975 to 1992 show that this assumption only exists in developing countries and not in developed countries.
Zokalj (2016)	25 EU Countries	The aging process has a negative impact on the public budget, as the increase in expenditures for the elderly is greater than the effect of public revenues.
Lee et al. (2017)	Developing Asia	Findings show that Asia's population aging will negatively affect its ability to sustain its finances, highlighting the need for Asian nations to further investigate the effect of demographic changes on their financial stability.
Beznoska & Hentze (2017)	Germany	According to the micro-simulation model used in the study, the German economy will shrink due to the aging population, and this will cause a decrease in public revenues and cause great pressure on public finance.
Prammer (2019)	Austria	According to the study, it has been determined that aging puts pressure on revenues obtained from personal income taxes and social security contributions.
Dağ (2019)	Turkey	In this study, the sustainability of the social security institution budgets for Turkey was investigated. The resulting results show that the budget sustainability of the social security institution is weak.
Kaymak & Dökmen (2021)	36 OECD Countries	In the study, there is a positive and statistically significant relationship between the elderly dependent ratio and budget deficits. On the other hand, it has been observed

		that the elderly dependency ratios have a positive effect on public expenditures and are in a significant relationship.

While many studies indicate a positive correlation between old age and tax compliance, some research suggests the contrary. Contrary to the prevailing belief that tax morale and tax compliance rise with age, Clotfelter (1983) discovered that as individuals age, both tax morale and compliance decrease. Similarly, Wallschutzky (1984) found that the elderly exhibit lower tax compliance and are more inclined to evade taxes.

The primary research question of this study is the impact of societal aging on public revenues. Consequently, the bulk of the literature review is derived from studies addressing this topic. A survey of the literature reveals significant correlations between aging and tax revenues. While the majority of studies indicate that aging has a diminishing effect on tax revenues, there are instances where tax revenues experience a slight increase due to aging.

5. Data, Model, and Findings

In this study, data spanning from 1971 to 2020 is utilized to assess the impact of aging on tax revenue in Turkey. For this objective, the proportion of tax revenues in the GDP was chosen as the dependent variable. The model's independent variables include per capita GDP (representing economic growth in Turkey), median age (indicating the degree of aging), total population, the count of university students enrolled, life expectancy at birth, and the percentage of the employed population. To mitigate estimation inaccuracies, logarithms of the series were derived and incorporated into the models. Data analysis was conducted using the Eviews 12 program.

Table 7: Variables Used in the Study and Their Descriptions

Variables	Abbreviations	Explanation	Data Source	Period
Share of Tax Revenues in GDP	LnTaxGDP	Share of Turkey's Tax Revenues in GDP	OECD	1971-2020
Median Age	LnMedian	Median Age of Turkey's Population	United Nations	1971-2020
Number of University Students	LnTertiary	Number of Students Enrolled at the University	OECD	1971-2020
Annual Inflation	LnInflation	Turkey's Annual Inflation Data	OECD	1971-2020
Total Population	LnPopulation	Total Population of Turkey	OECD	1971-2020
Percentage of Working Population	LnWorking	Ratio of Working Population to Total Population	OECD	1971-2020
Life Expectancy at Birth	LnExpectancy	Life Expectancy at Birth	World Bank	1971-2020

Before constructing a model, examining the stationarity of the series is a critical step. The stationarity of the series will influence the model's formulation and, subsequently, the test outcomes. Failing to scrutinize the series' stationarity could result in employing inaccurate models. Consequently, flawed policy recommendations may be made based on skewed parameter estimations.

Table 8: Unit Root Test Results

Series Name	Model		ADF		PP	
			Statistics	Prob.	Statistics	Prob.
LnTaxGDP	Level	None	1.566	0.9696	1.485	0.9643
		Constant	-0.998	0.7468	-1.003	0.7450
		Constant Trend	-1.353	0.8621	-1.453	0.8319
	First Difference	None	-6.086		-6.080	
		Constant	-6.473		-6.464	
		Constant Trend	-6.451		-6.447	
LnMedian	Level	None	2.645	0.9976	14.430	1.0000
		Constant	1.661	0.9995	1.662	0.9995
		Constant Trend	-4.338		-1.976	0.5995
	First Difference	None	0.019	0.6839	-1.099	0.2425
		Constant	-2.416	0.1427	-5.416	
		Constant Trend	-3.186	0.0995*	-6.147	
	Second Difference	None	-9.435		-15.537	
		Constant	-9.341		-15.350	
		Constant Trend	-9.188		-15.132	
LnTertiary	Level	None	2.540	0.9968	5.078	1.0000
		Constant	-0.622	0.8558	-0.061	0.9477
		Constant Trend	-3.804	0.0248**	-2.579	0.2909
	First Difference	None	-2.647		-2.661	
		Constant	-3.854		-3.991	
		Constant Trend	-3.791	0.0256**	-3.931	0.0181**
LnInflation	Level	None	-1.102	0.2417	-1.049	0.2613
		Constant	-1.754	0.3980	-1.686	0.4316
		Constant Trend	-2.157	0.5017	-2.082	0.5423
	First Difference	None	-7.508		-7.555	
		Constant	-7.428		-7.470	
		Constant Trend	-7.460		-7.649	
LnPopulation	Level	None	2.394	0.9954	13.643	1.0000
		Constant	1.287	0.9983	0.958	0.9955
		Constant Trend	-2.431	0.3593	-2.374	0.3876
	First Difference	None	-0.537	0.4786	-0.587	0.4575
		Constant	-4.958		-2.383	0.1515
		Constant Trend	-5.130		-2.166	0.4969
	Second Difference	None	-4.420	0.0000***	-2.920	0.0044***
		Constant	-4.374	0.0011***	-2.885	0.0546*
		Constant Trend	-4.470	0.0045***	-2.751	0.2218
LnWorking	Level	None	-0.225	0.5996	-1.278	0.1826
		Constant	-7.405	0.0000***	-7.484	0.0000***
		Constant Trend	-7.800	0.0000***	-10.959	0.0000***
		None	-7.750	0.0000***	-38.562	0.0000***

	First Difference	Constant	-7.677	0.0000***	-40.339	0.0001***
		Constant Trend	-7.604	0.0000***	-40.138	0.0000***
LnExpactancy	**Level**	None	6.751	1.0000	5.870	1.0000
		Constant	-4.076	0.0024***	-4.994	0.0001***
		Constant Trend	0.627	0.9994	1.983	1.0000
	First Difference	None	-1.462	0.1325	-1.916	0.0536*
		Constant	-3.150	0.0294**	-3.033	0.0388**
		Constant Trend	-5.015		-3.328	0.0738*
LnGDPPC	**Level**	None	2.372	0.9952	2.052	0.9895
		Constant	-2.208	0.2059	-2.116	0.2395
		Constant Trend	-2.136	0.5129	-2.481	0.3357
	First Difference	None	-5.952		-6.044	
		Constant	-6.574		-6.613	
		Constant Trend	-6.812		-6.823	

Note: *** indicates significance at the 1% level, ** at 5%, and * at the 1% level. In ADF unit root tests, the lag length criterion is determined as the Schwarz information criterion, and due to the use of annual data, the lag length is selected as 2. In the PP unit root test, the Bartlett Kernel was chosen as the spectral estimation method, and the Newey-West automatic was selected as the bandwidth criterion.

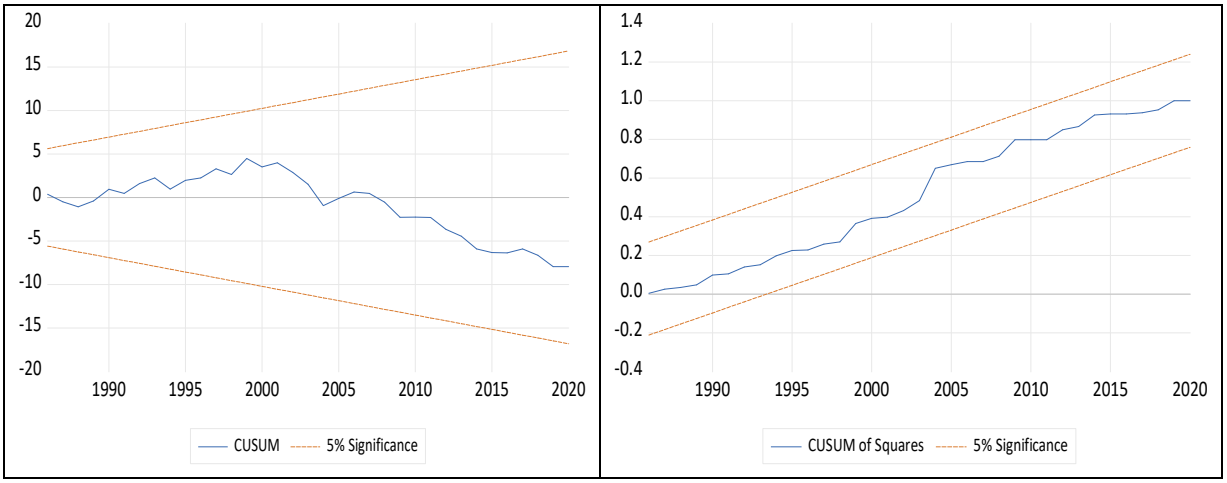
Table 8 presents the results of the ADF (Augmented Dickey Fuller) and PP (Phillips-Perron) unit root tests for the eight variables included in the model. The unit root statuses of the series vary: some series are stationary at the level, while others become stationary after two differences. The LnTaxGDP series achieves stationarity at the first difference in both test results, whereas the LnPopulation series reaches stationarity at the second difference based on the PP test results. Given that the series become stationary at differing levels, it's feasible to implement the ARDL (Auto-Regressive Distributed Lag Model) co-integration test.

Table 9: Diagnostic Test Results for ARDL Models

Model	Prob.
R^2	0.981617
Breusch-Godfrey Serial Correlation LM Test:	0.9818
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.5835
Histogram-Normality Test	0.4481
Ramsey RESET Test	0.7248

Table 9 provides the diagnostic test results of the ARDL model. In assessing the model, the closer the R2 value is to 1, the more reliable the model is considered. With a value of 0.981617, the model demonstrates high reliability. Additionally, the values for the Breusch-Pagan-Godfrey, LM Test, and Jarque-Bera Test exceeding 1% further attest to the model's dependability. These metrics suggest that there's no autocorrelation or heteroskedasticity in the model, the residuals are normally distributed, and there isn't a model specification error. The probability value of the Ramsey-Reset test being above 1% indicates the absence of model specification errors.

Graphic 3: Outputs of the CUSUM Test and CUSUM Square Test



Graphic 3 displays the results of both the CUSUM test and the CUSUM square tests. The red dashed lines denote the 5% significance level, which corresponds to the 95% confidence intervals, while the blue curve illustrates the parameter estimates. As the CUSUM and CUSUM square test results indicate that the parameter estimates lie within the 95% confidence interval marked by the red dashed lines, we can infer that the parameter estimates are stable.

Table 10: F-Bounds Test Results

Signif.	**ARDL order**	**F-Statistics, Bounds Test**
	7	3.54
	I(0)	I(1)
10 %	2.22	3.17
5 %	2.5	3.5
2.5 %	2.76	3.81
1 %	3.07	4.23

The diagnostic test results led to the selection of the ARDL (1, 2, 0, 0, 0, 0, 0, 1) model, which incorporates a constant term and a restricted trend. The computed bound F-Statistic value stands at 3.54. When juxtaposed with the critical values, this is above the upper threshold for both the 10% and 5% significance levels. This surpassing indicates a rejection of the null hypothesis of no co-integration at these significance levels. Hence, a co-integration relationship between the series is affirmed, suggesting a long-term interrelationship among the variables. Equation 1 provides the mathematical articulation of the estimated ARDL model.

$$LOG(TAXGDP) = C(1)*LOG(TAXGDP(-1)) + C(2)*LOG(INFLATION) + C(3)*LOG(INFLATION(-1)) + C(4)*LOG(INFLATION(-2)) + C(5)*LOG(POPULATION) + C(6)*LOG(TERTIARY) + C(7)*LOG(MEDIAN) + C(8)*LOG(EXPACTANCY) + C(9)*LOG(WORKING) + C(10)*LOG(GDPPC) + C(11)*LOG(GDPPC(-1)) + C(12) + C(13)*@TREND \quad (1)$$

Table 11: Error Correction Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-29.88085	4.779374	-6.252042	0.0000***
DLOG(INFLATION)	-0.051612	0.019183	-2.690531	0.0109**
DLOG(INFLATION(-1))	-0.049605	0.021586	-2.298025	0.0277**
DLOG(GDPPC)	-0.015769	0.042312	-0.372675	0.7116
CointEq(-1)*	-0.366194	0.058535	-6.255995	0.0000***

Note: *** indicates significance at the 1% level, ** at 5%, and * at the 1% level.

Table 11 displays the outcomes of the error correction model (ECM). Within the table, the ECM term indicates the duration needed for a model, which, if knocked off balance due to short-term shocks, will regain its equilibrium. The result for the ECM stands at -0.366194, and its coefficient is statistically significant at the 1% level. This outcome implies that the aftermath of any disturbance within the model is offset within roughly 2.7 periods, guiding the system back to a state of equilibrium.

Table 12: Long Term Coefficient Estimation Results (FMOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(INFLATION)	0.057695	0.017660	3.267012	0.0022***
LOG(POPULATION)	-0.869974	0.837470	-1.038812	0.3050
LOG(TERTIARY)	-0.113122	0.061399	-1.842407	0.0727*
LOG(MEDIAN)	2.719250	0.726347	3.743731	0.0006***
LOG(EXPACTANCY)	1.562617	1.519907	1.028100	0.3099
LOG(WORKING)	0.001110	0.008987	0.123530	0.9023
LOG(GDPPC)	0.090319	0.034975	2.582378	0.0135**
C	-0.357096	7.474303	-0.047777	0.9621

Note: *** indicates significance at the 1% level, ** at 5%, and * at the 1% level. The FMOLS test includes a constant term. The lag length is determined as 2 due to the use of annual data in long-term covariance calculations. Bartlett Kernel and Newey-West automatic bandwidth were selected. The Schwarz lag length is used as 1, and the Newey-West lag length is used as 2.

The results of the long-term coefficient estimation are presented in Table 12. As per these findings, a 1% rise in the median age elevates tax revenue by 1.2765%. This suggests a positive correlation between the degree of aging and tax revenues.

6. Conclusion and Suggestions

Throughout different stages of their lives, individuals' living conditions exhibit varying characteristics. Typically, during the earlier phases of an individual's life, their economic standing is somewhat inferior compared to later stages. Over time, as they gain more expertise in their professions, an upward shift in their income levels is anticipated. The accumulation of savings over the years also contributes to the evolution of individuals' financial statuses. The state of a person's financial status directly impacts their purchasing power and, subsequently, their tax-paying capability. As tax compliance and morality among

individuals improve, a concurrent rise in their tax efforts is anticipated. Hence, age-related demographic traits influence national economies via their effects on taxation.

Research examining the effects of demographic characteristics on tax compliance and morality generally suggests that aging enhances tax compliance. Although some studies have yielded contrary findings, the prevailing consensus in the literature is that aging leads to greater tax compliance. The older generation's aversion to facing sanctions, compared to their younger counterparts, and their subsequent tendency to take fewer risks, largely contribute to their higher tax compliance rates. The predominant reason attributed to older individuals being more compliant with taxes than the younger generation is the influence of the era's overall climate on the individual. Hence, it is only logical that older individuals, having participated in the economic sphere over many years and improved their financial statuses, possess greater purchasing power than the younger ones just embarking on their economic journeys. All other factors being equal, one would anticipate that older individuals with significant purchasing power would demonstrate a higher tax effort than the younger ones.

Nonetheless, policymakers must also weigh the ramifications of a graying population on social security outlays and healthcare expenses. As the demographic skews older, there will inevitably be heightened demands for healthcare services and pensions, potentially pressuring public coffers. So, while augmented tax revenues are advantageous, a holistic strategy is essential to address the potential surge in costs tied to an aging populace.

In this study, the impact of aging on tax revenue in Turkey between 1971 and 2020 was examined. The model employed per capita GDP as a representation of Turkey's economic growth, median age as a representation of the aging level, total population, the number of students enrolled in universities, life expectancy at birth, and the percentage of the working population as independent variables. Based on the ADF (Augmented Dickey Fuller) and PP (Philips-Perron) unit root tests for the eight variables used in the model, the unit root statuses of the series were found to be heterogeneous; they either remain stationary at their levels or become stationary at the second difference. The model incorporates a constant term and a restricted trend. The ARDL cointegration test indicated a rejection of the no cointegration hypothesis at the 10% and 5% significance levels. This suggests a long-term relationship exists between the variables. The Error Correction Model (ECM) yielded a result of -0.366194, with its coefficient being significant at the 1% level. This indicates that any disturbances in the model are corrected in approximately 2.7 periods, returning the system to equilibrium within this timeframe.

As per the FMOLS (Fully Modified Ordinary Least Squares) test outcomes, a 1% surge in inflation augments the tax revenue's share in GDP by 0.05%. Concurrently, a 1% rise in the median age boosts the tax revenue's share in GDP by 2.71%, while a 1% increment in university enrolments diminishes it by 0.11%. Additionally, a 1% enhancement in per capita GDP results in a 0.09% increase in the tax revenue's share within the GDP.

The coefficients of the other variables utilized in the study model are statistically insignificant. As the median age rises, indicating an overall aging of society, there is an upswing in the share

of tax revenues within the GDP. Intriguingly, even though the impact is minimal, an increase in the education level negatively influences the share of tax revenues within the GDP.

Furthermore, Turkey might consider initiatives to bolster the labor force participation of older individuals and provide incentives for them to extend their working years. Such steps could not only amplify productivity but also result in increased income and consumption taxes.

Subsequent studies might delve deeper into the causality relationship between aging and tax revenues, exploring the intermediaries that shape this relationship. This would furnish a richer understanding of the interplay between aging and public finances in Turkey.

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Çıkar Beyanı: Yazarlar arasında çıkar çatışması yoktur.

Etik Beyanı: Bu çalışmanın tüm hazırlanma süreçlerinde etik kurallara uyulduğunu yazarlar beyan eder. Aksi bir durumun tespiti halinde Fiscaoeconomia Dergisinin hiçbir sorumluluğu olmayıp, tüm sorumluluk çalışmanın yazarlarına aittir.

Yazar Katkısı: Tüm yazarlar eşit olarak katkıda bulunmuştur.

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