Hacettepe University Graduate School Of Social Sciences

Department of Economics

ESSAYS ON HUMAN CAPITAL

Kenan KARAKÜLAH

Ph. D. Dissertation

Ankara, 2024

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The jury finds that Kenan KARAKÜLAH has on the date of 06/06/2024 successfully passed the defense examination and approves his Ph. D. Dissertation thesis titled "Essays on Human Capital".

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Bu çalışmadaki bütün bilgi ve belgeleri akademik kurallar çerçevesinde elde ettiğimi, görsel, işitsel ve yazılı tüm bilgi ve sonuçları bilimsel ahlak kurallarına uygun olarak sunduğumu, kullandığım verilerde herhangi bir tahrifat yapmadığımı, yararlandığım kaynaklara bilimsel normlara uygun olarak atıfta bulunduğumu, tezimin kaynak gösterilen durumlar dışında özgün olduğunu, **Prof. Dr. Derya GÜLER AYDIN** danışmanlığında tarafımdan üretildiğini ve Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Yazım Yönergesine göre yazıldığını beyan ederim.

Kenan KARAKÜLAH

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ABSTRACT

KARAKÜLAH, Kenan. *Essays on Human Capital,* Ph. D. Dissertation Thesis, Ankara, 2024.

This thesis aims to investigate human capital through three interlinked components. The first part of the study examines impact of the 1997 education reform on individual's earnings in Türkiye. Türkiye's national education system has undergone significant changes in the last 30 years. The extension of mandatory schooling to eight years in 1997 and the requirement for secondary education in 2012 are significant policy changes that aimed to improve educational attainment in the country. The cohort born after 1986, who benefited from the 1997 education reform, experienced higher returns to education, which is reflected in their earnings compared to those born before 1987 with the same level of education and experience.

The second section of the study analyzes human capital wealth through a proposed monetary approach to capture the value of human capital. Even though Türkiye has a great potential of her youth, the literature doesn't shed light on how Türkiye can benefit from its potential. To do that, estimating human capital wealth is crucial. Human capital wealth is estimated as the total present value of the expected future labor income that could be generated over the lifetime of people currently living in a country.

The third section analyzes the direct impact of smoking on human capital in Türkiye by introducing a new method of measuring the loss of human capital wealth. Accounting for approximately one-third of total deaths, smoking is the second leading risk factor for health in Türkiye following high systolic blood pressure. It is estimated that premature deaths attributable to smoking erodes about $66 (in 2021 constant US$) from the per capita wealth in 2020. In other words, eliminating smoking in Türkiye would reduce premature deaths, and this in turn would boost Türkiye's human capital wealth by approximately 0.8 percent per year.

Keywords

ÖZET

KARAKÜLAH, Kenan. *Beşeri Sermaye Üzerine Makaleler,* Doktora Tezi, Ankara, 2024.

Bu tez, beşeri sermayeyi birbiriyle bağlantılı üç bileşen aracılığıyla incelemeyi amaçlamaktadır. Çalışmanın ilk bölümünde Türkiye'de 1997 eğitim reformunun bireylerin kazançları üzerindeki etkisi incelenmektedir. Türkiye'nin Milli Eğitim sistemi son 30 yılda önemli değişikliklere uğramıştır. 1997'de zorunlu eğitimin sekiz yıla çıkarılması ve 2012'de ortaöğrenimin zorunlu hale getirilmesi, ülkede eğitim başarısını artırmayı hedefleyen önemli politika değişiklikleridir. 1997 eğitim reformundan yararlanan 1986'dan sonra doğan grup, aynı eğitim ve deneyim düzeyine sahip 1987'den önce doğanlarla karşılaştırıldığında, işgücü piyasasında daha yüksek getiri elde etmiştir.

Çalışmanın ikinci bölümünde beşeri sermayenin parasal değerinin hesaplanmasına ilişkin bir yöntem önerilerek Türkiye'de beşeri sermayenin 1990-2020 yıllarına ilişkin değeri hesaplanmaktadır. Bu bölümde beşeri sermaye refahı, halihazırda bir ülkede yaşayan insanların gelecekteki beklenen emek gelirinin toplamının bugünkü değeri olarak tahmin edilmektedir.

Çalışmanın üçüncü bölümünde, Türkiye'de sigaranın beşeri sermaye üzerindeki doğrudan etkisi analiz edilmektedir. Toplam ölümlerin yaklaşık üçte birini oluşturan sigara, Türkiye'de yüksek sistolik kan basıncından sonra ikinci en önemli sağlık risk faktörüdür. Sigaraya atfedilebilecek erken ölümlerin 2020 yılında kişi başına düşen servetten yaklaşık 66 ABD Doları (2021 sabit fiyatlarıyla) erozyona uğratacağı tahmin edilmektedir. Başka bir deyişle, Türkiye'de sigara bağımlılığının tamamen ortadan kaldırılması halinde buna dair erken ölümler yok olacak ve böylece Türkiye'nin beşeri sermaye refahının yılda yaklaşık yüzde 0,8 artacağı hesaplanmaktadır.

Anahtar Sözcükler

Beşeri sermaye, Beşeri sermaye refahı, Ekonomik kalkınma, Eğitim reform, Sigara kullanımı, Ücretler.

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INTRODUCTION

"Many paradoxes and puzzles about our dynamic, growing economy can be resolved once human investment is taken into account (...) The man without skills and knowledge leaning terrifically against nothing."

Theodore W. Schultz (1961), Investment in Human Capital

"Human capital analysis starts with the assumption that individuals decide on their education, training, medical care, and other additions to knowledge and health by weighing the benefits and costs. Benefits include cultural and other non-monetary gains along with improvement in earnings and occupations, while costs usually depend mainly on the foregone value of the time spent on these investments."

Gary S. Becker (1992), The Economic Way of Looking at Life

"Human capital consists of the knowledge, skills, and health that people invest in and accumulate throughout their lives, enabling them to realize their potential as productive members of society." (World Bank 2019). Human capital captures the skills, competencies, and knowledge that individuals bring to the workplace. This includes both technical skills (e.g., programming and engineering) and soft skills (e.g., communication and leadership) that contribute to organizational success.

Human capital theory focuses on the idea that individuals' knowledge, skills, and abilities are valuable assets that can be invested in and developed to enhance productivity and economic growth. Human capital theory emphasizes the importance of education, training, and experience in increasing individuals' value to organizations and society.

Organizations and individuals make investments in human capital through activities such as education, training, and development programs. These investments are aimed at enhancing the knowledge, skills, and abilities of individuals, which can lead to improved performance and productivity. Human capital also encompasses the transfer and retention of knowledge within organizations. This includes capturing and sharing tacit knowledge, developing learning organizations, and managing the impact of employee turnover on organizational knowledge.

Human capital is at the core of a country's economic and social development. Investing in human capital, through education, health care, and other means, is essential for addressing development challenges and improving the quality of life for people around the world. By enhancing the capabilities and productivity of individuals, countries can create a more skilled workforce that is capable of driving progress and adapting to the changing demands of the global economy.

While produced capital (like machinery and infrastructure) and natural capital (such as land, minerals, and forests) are essential for economic activity, they are indeed finite and can be depleted or degraded over time. In contrast, human capital can grow and develop, becoming more productive with the right investments. A focus on human capital is often more sustainable because it can lead to improvements that benefit not only the current generation but also future generations. For example, better-educated individuals tend to be healthier and more productive, and they can pass on their knowledge and skills to their children.

Therefore, many development strategies emphasize the importance of investing in people to create a virtuous cycle of growth and development that can be sustained over the long term. This approach aligns with the World Bank's emphasis on human capital

as a key factor in achieving its twin goals of eradicating extreme poverty and promoting shared prosperity.

Prior to the 1950s, economic theory largely overlooked the role of human capital, but since then, economists have begun to recognize its importance in explaining differences in income and growth. Despite being not a modern empirical study, Adam Smith's masterpiece—*The Wealth of Nations*—discussed the importance of human skills and capabilities for economic prosperity, laying the groundwork for the concept of human capital. The term *'human capital'* began to be used more formally in the early 20th century by economists to describe the stock of skills and knowledge embodied in an individual. However, it was not until 1950s that economists took human capital as an important aspect of economic development. In 1961, Theodore W. Schultz brought forward the idea of treating human as a form of capital in his work called *"Investment in Human Capital"*, and developed human capital theory of economic development. Schultz (1961) proposed that human capital is a form of capital and that investment in education, training, and enhanced benefits for workers could lead to a more skilled workforce and, in turn, contribute to economic development. This theory has had a significant impact on the fields of labor economics and development economics, influencing how economists and policymakers view the role of education and skill development in economic growth.

Gary Becker further developed human capital notion in his 1962 paper *"Investment in Human Capital: A Theoretical Analysis."* In this work, Becker elaborated on the idea that investments in education, training, health, and other forms of human capital can improve productivity and result in better earnings over a person's lifetime, much like investments in physical capital can improve production capabilities in traditional economic theory. In this work he also pioneered the economic concept of human capital and for the first time examined links between education and incomes. Becker's work laid the foundation for the field of human capital theory and has had a profound impact on labor economics, education economics, and policy design. Becker's groundbreaking classic—*Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education (1964)*—laid the foundation for the economic analysis of human capital, emphasizing the role of education and training in economic development.

Gary Becker's human capital theory has had a profound influence on modern labor economics. Becker's human capital theory has provided a comprehensive framework for understanding the role of education, training, health, and other forms of human capital in shaping individual outcomes and driving economic development. Becker's framework has been used to analyze the effects of technological change on the demand for different types of skills in the labor market. It has helped economists understand how technological advancements can affect the distribution of wages and employment across various skill levels.

During 1970s, the human capital theory was expanded to include health, on-the-job training, and other personal investments as part of human capital. Economists began to explore human capital's function in economic development, technological change, and income distribution.

Since the 1980s, human capital has become one of the key components of the neoclassical growth accounting frameworks as well as endogenous growth models. Robert Lucas's 1988 paper—Human Capital and Growth: Theory and Evidence—developed a model of economic growth that emphasizes the role of human capital accumulation in the growth process, suggesting that the knowledge and skills of the workforce are pivotal for development. Romer (1990) introduced a model of economic growth that incorporated human capital as a driver of technological innovation and economic expansion as Barro (1991) highlighted the significance of human capital in explaining differences in growth rates across countries in his empirical analysis by measuring human capital through educational attainment. Furthermore, Mankiw, Romer and Weil (1992) extended the Solow growth model to include human capital in their influential paper and showed human capital's substantial contribution to economic growth. Benhabib and Spiegel (1994) provided empirical evidence on the human capital's impact on economic growth using cross-country data. They found that human capital, as measured by educational attainment levels, has a significant and positive effect on the rate of economic growth. This study contributed to the empirical literature on endogenous growth theory, which emphasizes the role of human capital and knowledge as eminent drivers of sustained economic growth. Card (1999) provided empirical evidence of the economic returns to education, showing that higher education

correlates with higher income. Card's findings support the human capital theory, which posits that investments in education yield increased productivity and earnings. Card's work has been influential in the field of labor economics and has contributed to policy discussions on the importance of investing in education.

Today human capital is accepted as the most important endowment of a country, making up about 60 percent of total wealth of nations (World Bank 2021). Moreover, the importance of human capital in economic theory seems to continue to improve during the years to come. The rise of automation and artificial intelligence has increased the importance of human capital, particularly the need for skills that complement technology, such as critical thinking, creativity, and interpersonal skills. Human capital is linked to innovation, as a more educated and skilled workforce is better equipped to generate new ideas, products, and processes, which are essential for competitive advantage. In addition, globalization has increased the demand for a more skilled workforce capable of adapting to diverse and changing environments. Human capital development is crucial for countries and organizations to remain competitive in a global market.

This Ph.D. dissertation thesis investigate human capital in Türkiye through three interlinked components. The first chapter of the study examines impact of the 1997 education reform on individual's earnings in Türkiye. In the last 30 years, Türkiye's education system has undergone several significant curriculum upgrades aiming a modernized and high-quality education system.

The education reform in Türkiye in 1997, known as the *"8-year uninterrupted education"* reform, was a significant change in the Turkish education system. This reform mandated that all students must complete eight years of compulsory education without interruption before proceeding to high school or vocational schools. The aim was to increase the level of education in the country and to ensure that all children had access to a basic education (Sasmaz 2014). In 2012, Türkiye transitioned from the previous eight-year primary education model to the 4+4+4 system, which restructured the education system into four years of primary school, four years of middle school, and four years of high school. This reform aimed to provide an expanding participation in

upper secondary education (Kitchen et al. 2019). These reforms have aimed to enhance the overall quality of education and better prepare students for the demands of the modern world. However, it is noteworthy that some specifics of these reforms have evolved over time.

Considering substantial impact of educations reforms in Türkiye, the first chapter of this study focuses on the impact of education on labor market wages. Using the mandatory extended primary schooling reform (hereafter the 1997 education reform) as an instrument, I compare labor market wages in Türkiye. The research question for this chapter is how the 1997 education reform influenced labor market wages (male and female separately) in Türkiye. Using microdata from the Household Labor Force Survey (HLFS) from Turkstat, I estimate the impact of mandatory eight-year schooling on labor market wages in Türkiye using the well-known Mincerian wage equation.

The second chapter of the study analyzes human capital wealth through a proposed monetary approach to capture the value of human capital. My research question for this chapter is how Türkiye's human capital wealth has evolved since 2004. Even though Türkiye has a great potential in her youth, the literature does not shed light on how Türkiye can benefit from this potential. To do that measuring the human capital wealth stock is a critical step. Using microdata from the HLFS from Turkstat, I estimate Türkiye's human capital wealth since 2004 using the lifetime income approach that builds on the expected earnings' present value.

The suggested approach has some compelling benefits. First and foremost, this approach provides a comprehensive measure of the economic value of an individual's potential earnings over their lifetime, which can be aggregated to estimate the total human capital wealth of a country. Second, by quantifying human capital, policymakers can better understand the economic impact of investments in education, healthcare, and other areas that contribute to the productivity and earning potential of the population. Moreover, the approach can reveal the value of different levels of education and types of training, which can guide decisions about educational policies and the allocation of resources to different educational programs in addition to analysis of disparities in human capital across different regions, genders, and demographic groups, which can be

crucial for targeted interventions to reduce inequality. Furthermore, understanding the present value of future earnings can help in analyzing labor market dynamics, including the potential impact of technological changes and globalization on employment and wages. Last but not least, it contributes to a better understanding of global economic standing and competitiveness of a country by enabling international comparisons of human capital wealth.

It's important to note that while the lifetime income approach has these benefits, it also has limitations and assumptions that need to be carefully considered. For instance, it may not fully account for non-market contributions to society, such as unpaid work or volunteering, and it relies on the assumption of stable future earnings and employment rates. Additionally, the choice of discount rate can significantly affect the present value calculations.

Last but not least, the third chapter touches on another quality aspect of human capital: health. As per Gary Becker's interpretation, human capital encompasses more than just education and training; it also comprises added knowledge, good health, work experience, and health habits, even including harmful addictions such as smoking and drug use (Becker 1993). This broader interpretation of human capital recognizes that investments in people, such as health care, on-the-job training, and even migration to better opportunities, contribute to an individual's ability to produce economic value. Therefore, concept of human capital includes health as a significant component. Investments in health care contribute to an individual's human capital by improving their overall well-being, productivity, and earning potential. When individuals have access to quality health care, they are more likely to be in good physical and mental condition, which can positively impact their ability to work, learn, and contribute to the economy. By recognizing the role of health in shaping human potential and productivity, human capital framework emphasizes the significance of health investments as a means of enhancing human capital and promoting economic development.

Building on the methodology introduced in Chapter 2, I compute the monetary value of the impact of smoking on human capital wealth in Türkiye throughout Chapter 3.

Accounting for approximately one-third of total deaths, smoking is the second leading risk factor for health in Türkiye following high systolic blood pressure. Accounting for approximately one-third of total deaths, smoking was responsible for approximately 100,000 deaths in Türkiye every year. So, reducing smoking considerably contributes to human capital. To that end, Chapter 3 analyzes the direct impact of smoking on human capital in Türkiye by estimating of monetary value of the loss of human capital. Same methodology can be applied to other risk factors to human health, such as high systolic blood pressure, air pollution, and diabetes. The main contribution of Chapter 3 to the literature is proposing a monetary approach to materialize the loss of human capital due to risk factors to human health.

CHAPTER 1

IMPACT OF EDUCATION ON LABOR MARKET WAGES IN TÜRKİYE

"If you think education is expensive, wait until you see how much ignorance costs in the 21st century. If we don't make this investment, we're going to put our kids, our workers, and our country at a competitive disadvantage for decades."

Barack Obama (2013), Remarks by the President on the Economy—Knox College, Galesburg, IL

"In the long run, the best way to reduce inequalities with respect to labor as well as to increase the average productivity of the labor force and the overall growth of the economy is surely to invest in education."

Thomas Piketty (2014), Capital in the Twenty-First Century

1.1. INTRODUCTION

The human capital theory suggests that education improves individuals' skills and productivity, making them more valuable to employers. As a result, individuals with more education tend to have better employment prospects, higher earning potential, and

are more likely to be employed in jobs that require specialized skills or knowledge. By developing the skills, knowledge, and health of its population, a country can position itself for greater economic prosperity and social development.

Investments in human capital have been shown to have a significant impact on a country's economy. Research has demonstrated that investments in education and training contribute to long-term economic growth. For instance, a report by the OECD highlighted that the estimated long-term impact of additional schooling in OECD was estimated about 3 percent to 6 percent of per capita GDP (OECD 2006). Furthermore, human capital investments can lead to higher labor productivity, as individuals with better skills and knowledge are generally more efficient and effective in their work. In addition, a well-educated and skilled workforce is more likely to drive innovation and technological advancement, which are crucial for sustained economic development. Countries with higher levels of human capital tend to be more innovative and adaptable to technological changes, leading to increased competitiveness and economic diversification.

Education is a fundamental human right and a significant force for development. It stands as one of the most effective tools for poverty alleviation and enhancement of health, gender parity, peace, and stability. It yields substantial and steady income returns and is the key determinant in promoting equity and inclusion (World Bank 2023a).

All forms of education, including formal education, informal education, on-the-job learning, and work experience, represent significant investments in human capital. There is a rich literature highlighting the importance of investing in education to improve human capital. In addition, most studies acknowledge that higher education and experience tend to result in higher salaries. Moreover, the related literature underlines that there are significant productivity improvements associated with a more educated population. For instance, Botev et al. (2019) found strong evidence between human capital and productivity across OECD countries.

Several recent studies suggest that education plays a dual role in economic development, and it is a cornerstone for both individual and societal advancement, driving progress in various sectors and contributing to the overall development of a nation (e.g. Vandenbussche, Aghion, and Meghir 2006; Ciccone and Papaioannou 2005). As an investment in human capital, it equips individuals with the knowledge and skills necessary to participate effectively in the workforce and contribute to economic activity. Additionally, education fosters research and development by nurturing critical thinking, creativity, and innovation. It also facilitates the diffusion of technologies by ensuring that the workforce can understand, adopt, and adapt new technologies to local contexts. This, in turn, can lead to increased productivity, economic growth, and the ability to compete in a global market.

Several empirical studies propose evidence for education's role on earnings and economic growth. According to Hanushek and Woessmann (2007), educational quality has compelling impacts on individual earnings, allocation of income, and economic growth. In addition, attending school is a worthwhile private and social investment. Hanushek and Woessmann (2007) also found that additional year of schooling extensively contributes to long-run growth rates. In addition, additional schooling's impact on long-run growth rates is much greater (more than double) for non-OECD countries compared to OECD countries (Hanushek and Woessmann 2007). Furthermore, Hanushek and Kimko (2000) found that both education quality and schooling have significant positive impacts on economic growth, impact of education quality is noticeably greater than that of schooling.

Because there are strong links between investment in education and economic development, countries make some improvements in their education systems from time to time. In the last 30 years, Türkiye's education system has undergone several significant curriculum reforms aimed at modernizing and improving the quality of education. Two of the most impactful changes in Türkiye's national education system were made in 1997 and 2012. The education reform in Türkiye in 1997, known as the "8-year uninterrupted education" reform, was a significant change in the Turkish education system. This reform mandated that all students must receive eight years of continuous, compulsory education, starting from the age of 6 or 7. Prior to the reform,

compulsory education in Türkiye lasted only five years. The extension aimed to improve educational standards, increase literacy rates, and provide a more solid educational foundation for Turkish children (Sasmaz 2014).

In addition, secondary education became mandatory for all students in 2012. The Turkish government extended compulsory education from 8 years to 12 years under the "4+4+4" education system. This system divided the 12 years of mandatory education into three levels: primary school (first four years), middle school (second four years), and high school (final four years). This reform aimed to improve the quality of education and ensure that all children had access to secondary education (Kitchen et al. 2019).

This chapter focuses on the impact of education reform on labor market wages. Using the compulsory extended primary schooling reform (hereafter the 1997 education reform) as an instrument, I compare labor market wages in Türkiye. My research question for this chapter is how the 1997 education reform affected labor market wages (male and female separately) in Türkiye. Using microdata from the Household Labor Force Survey (HLFS) from Turkstat, I estimate the effect of compulsory extended primary schooling on labor market wages in Türkiye using the well-worn Mincerian wage equation. By including a variable for the years of education before and after the reform, the model enables us to estimate the impact of the additional years of compulsory schooling on labor market outcomes (wages).

1.2. EDUCATION REFORMS IN TURKIYE

The Turkish education system has undergone many reforms in the past 30 years. The reforms covered a broad range of topics, ranging from curriculum changes to mandatory years of schooling. Since I am touching on the effects of mandatory years of schooling in this chapter, I include only education reforms on mandatory years of schooling in this chapter.

Before the education reform in 1997, five-year primary education had been mandatory and free for all citizens in public schools since the foundation of the Republic of

Türkiye. A non-compulsory preschool precedes formal education in Türkiye. Formal education continues with a three-year middle school and three-year high school. Some high schools offer a one-year English intensive pre-class before a three-year formal high school education. Before the education reform in 1997, middle school and high school were voluntary, whereas elementary school completion was mandatory.

The 1997 education reform in Türkiye aimed to affect the labor market in several ways. By extending compulsory education from five to eight years, the reform sought to improve the overall educational attainment of the Turkish workforce. This, in turn, was expected to have a positive impact on the skills and productivity of the labor force, potentially leading to higher wages and better employment opportunities.

The 1997 education reform also aimed to reduce disparities in education by ensuring that all children, regardless of their socio-economic background, had access to a more comprehensive education. By providing a longer period of compulsory education, the reform intended to equip individuals with the skills and knowledge necessary to compete in the modern labor market.

Furthermore, the emphasis on education was expected to lead to a more skilled and knowledgeable workforce, which could contribute to economic growth and development. As a result, the reform was designed to have a long-term impact on the Turkish labor market by creating a more educated and skilled workforce that could meet the demands of a changing economy.

In addition, the Turkish government enacted a law in 2005 to increase secondary education from three years to four years, but it was not mandatory for all citizens until 2012. The Turkish education reform in 2012, known as the "4+4+4" education system, was a significant overhaul of the education structure in Türkiye. It extended compulsory education from 8 years to 12 years, divided into three levels: primary school (first four years), middle school (second four years), and high school (final four years). This reform aimed to provide greater flexibility in educational paths, increase vocational and technical training opportunities, and better prepare students for the labor market.

1.3. RELATED LITERATURE

1.3.1. Effects of Education on Earnings

Arguments about the relationship between schooling and wages are one of the hot topics in related literature. The theory of human capital has so far resulted in one common conclusion about the relationship between schooling and wages: As schooling increases, wages increase (MacDonald 1981).

Psacharopoulos (1981 and 1985) found that private returns to primary education slightly decline over time, and returns are highest for primary education. Moreover, Psacharopoulos and Patrinos (2004) suggested that private returns to higher education have been increasing.

Card (2001) suggests a test of the screening hypothesis to understand the relationship between education and earnings. He found that education is generally associated with higher earnings because of productivity rather than screening (Card 2001). In addition, Hanushek and Woessmann (2007) found that both schooling and educational quality have robust effects on individual earnings.

Montenegro and Patrinos (2014) analyzed private returns to education for some countries using the Mincerian earnings function. They found a consistently large private return to higher education in Türkiye during the 2002-2010 period. Mocan (2014) analyzed the 2011 and 2012 Household Labor Force Survey (henceforth HLFS) of Türkiye to measure the 1997 education reform's impact on labor market wages and education attainment. She found that the reform increased the number of children getting middle school diploma by more than 20 percentage points as girls utilized the reform more than boys. In addition, the study found that the reform contributed to about 14 percent increase in average earnings for each additional year of schooling as the increase is much higher in females compared to males (Mocan 2014).

Torun (2015) analyzed the effects of the 1997 reform on labor market wages. He found that the reform increased the average years of education by 0.56 years among women

and 0.43 years among men. In addition, the 1997 education reform had positive effects on earnings, but the magnitude was different for men and women. While the 1997 education reform's effect on men's earnings is limited, it has large positive effects on women's earnings (Torun 2015).

Karatas (2018) analyzed 2009-2014 HLFS to analyze returns to formal schooling in Türkiye by constructing pseudo-panel data. The study found that one additional year of education increases individual wages by approximately 8.5 percent.

Patrinos et al. (2019) estimated private and social returns on investment in education in Türkiye using the 2017 HLFS. By employing the three-year increase in compulsory education from the 1997 reform as an instrument, the authors concluded that it enhanced both the private and social returns (Patrinos et al. 2019).

1.3.2. Methods in the Literature

Two main methods are used in the literature to calculate the effects of education on labor market wages. These methods are the full discounting method and the Mincerian earnings function. The full discounting method calculates the social rate of return on investment in education by calculating the discount rate that equates the present value of the stream of benefits (higher future earnings due to education) to the present value of the costs (direct costs like tuition and indirect costs like forgone earnings while studying). This method considers the time value of money, as it discounts future benefits and costs to their present values (Psacharopoulos and Mattson 1998; Psacharopoulos 1995).

The second method is the famous Mincerian earnings function, which was developed by Jacob Mincer in 1974. The Mincerian earnings function is a statistical model that estimates the relationship between earnings and education level, along with other variables such as work experience. The function typically takes the form of a regression equation where the natural logarithm of earnings is represented as a function of years of schooling and potential work experience (Mincer 1974). The coefficients from this regression provide estimates of the returns to an extra year of education, usually

interpreted as the percentage increase in earnings associated with an additional year of schooling, after controlling for work experience and other factors. The Mincerian wage regression calculates private returns to education, while both private and social returns to education can be calculated using the full discounting method (Psacharopoulos and Mattson 1998; Psacharopoulos 1995).

1.4. DATA AND METHODOLOGY

1.4.1. Data

I have received 2019 annual data of the Household Labor Force Survey (HLFS) from the Turkish Institute of Statistics (TUIK). The HLFS dataset compiles demographic details such as age, gender, marital status, household composition, place of living, and education. In addition to demographic data, the survey primarily collects key information on employment, sector of employment, and earnings. Assigning population weights to each observation in the data ensures that our descriptive statistics and regressions are representative of the national population.

I analyze the year 2019 since the education reform occurred in 1997, and it would show its effects during the 2010s considering that beneficiaries of the reform were less than 11 years old in 1997. Therefore, exposure to the mandatory middle school reform is represented by a binary indicator that takes the value of one for those born after 1986 .

The main variables for this study were annual earnings, years of education, employment status, age, and gender. Some variables used in this paper, such as years of education, are not directly available from the HLFS. Table 1 includes variables used in this paper and the corresponding variables in the HLFS. For instance, years of education is calculated using four variables from the HLFS since the HLFS doesn't directly report the years of education.

Table 1: Variable Information

Variables in the paper	HLFS Variables
age	yas
gender	cinsiyet
earnings (annually)	Calculated as follows: 12*gelir_gecenay_k
years of education	Calculated using variables okul_biten_k, egitim_devam_k, okul_devam_k, and sinif_devam
employment status	Calculated using variables calisma and isteki_durum_k

Even though the 2019 HLFS includes 366,551 observations, 294,221 observations are used in this paper since the paper focuses on working age population (ages 18-65). To me, the most striking descriptive statistics is the average years of education, which is just 7.44 years for women and 9.13 years for men. On average, the education level of Turkish working age population is just primary education. This is very overwhelming given that the country's education system has undergone crucial reforms. Table 2 includes descriptive statistics for the variables used in this paper.

Table 2: Descriptive Statistics

	Overall		Women		Men	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
# of observations	294,221		150,827		143,394	
Age	40.59	13.32	40.68	13.28	40.50	13.37
Household size	3.93	1.80	3.89	1.82	3.96	1.78
Average years of education	8.26	5.17	7.44	5.39	9.13	4.78
Average years of experience	26.33	15.76	27.24	5.39	25.37	15.27
Average Monthly Income	2,795.4	2,006.0	2,600.3	1,870.8	2,883.4	2,058.1

1.4.2. Methodology

The Mincerian earnings function is indeed a cornerstone of empirical labor economics and is widely used to study the relationship between education and labor market wages. The model, named after economist Jacob Mincer, posits that an individual's earnings can be modeled as a function of their years of education and labor market experience.

The basic form of the Mincerian earnings function is:

(1) $$Ln(w_i) = \alpha + \beta_1 e_i + \beta_2 X_i + \beta_3 X_i^2 + \mu_i,$$

where $Ln(w_i)$ is the natural log of earnings for the individual i, e_i is years of schooling (from 0 to 24), X_i is the potential working experience, which is often reckoned as age minus years of schooling minus a constant representing the age at which schooling typically starts, X_i^2 is the square of potential labor market experience, capturing the nonlinear relationship between experience and earnings (e.g., earnings growth may slow down after a certain number of years in the labor market), and μ_i is a random disturbance term reflecting unobserved abilities. The coefficient β_1 measures the return to an additional year of schooling, while the coefficients β_2 and β_3 measure the return to potential labor market experience. Due to decreasing marginal return in labor market experience, the coefficient β_3 is expected to be negative. Moreover, the constant α measures the average log earnings of persons with no education and no labor market experience (Mincer 1974). The coefficient for the equation (1) is calculated for males and females separately.

The model assumes that earnings increase with both education and experience, but at a decreasing rate with respect to experience (due to the quadratic term). It has been used extensively to estimate returns to education and to analyze wage differentials across different groups of workers.

Although the Mincerian model has been influential and widely used, it is also subject to certain limitations and criticisms. For example, it assumes that all years of education are equally valuable, does not account for the quality of education, and may not fully capture the complexity of the relationship between education, experience, and earnings. Nonetheless, it remains a fundamental tool in the analysis of labor market data.

The Mincerian earnings function is attractive for its simplicity and ease of estimation using ordinary least squares (OLS) regression. However, the OLS relies on certain assumptions, one of which is that the regression model includes all relevant variables. If relevant variables are omitted and these omitted variables are correlated with both the independent variable(s) and the dependent variable, this can lead to omitted variable bias.

In the context of the Mincerian earnings function, if individual ability is an unobservable factor that influences both wages and education and is not included in the model, the estimated coefficients may be biased. This is because ability could be positively correlated with education (more able individuals may obtain more education) and with earnings (more able individuals may also earn higher wages), leading to a spurious correlation between education and earnings.

Therefore, the omitted ability bias could result in overestimating the returns. Furthermore, the surveys could include measurement errors. Measurement errors trigger attenuation bias and result in underestimation of the OLS procedure.

Economists have developed several methods to address omitted variable bias, such as using instrumental variables (IV), which are correlated with endogenous explanatory variables (like education) but uncorrelated with the error term, or employing fixed effects models in panel data to control for unobserved individual heterogeneity. These techniques help to remove the causal effect of education on earnings by accounting for unobservable factors like individual ability.

To address the omitted variable bias, the instrumental variable (IV) estimation method is used in this chapter. Instrumental variables are correlated with the endogenous

explanatory variables but are uncorrelated with the error term. The 1997 education reform is selected as an instrumental variable in this chapter because it raised the bar for minimum years of schooling. In addition to addressing the issue of endogeneity of the education variable in the earnings equation, the instrumental variable methodology ensures consistent estimates of the effect of education on earnings.

I propose a methodology that involves estimating the first stage and reduced form effect of raising the minimum number of years of schooling through a global polynomial approximation.

I estimate the first stage and reduced form effect of raising the minimum number of years of schooling by means of a global polynomial approximation. This approach necessitates the utilization of the entire sample and choosing a flexible high-order polynomial to accurately model the relationship between an outcome Y_i (annual earnings) and the key explanatory variable X_i (school cohort), while also accommodating a shift in the intercept at the cutoff (c). In this study, the cutoff is the 1986 birth cohort, as explained in the *'Data'* subsection of this chapter. Therefore, the first-stage specification is as follows:

(2)
$$e_i = \gamma + \delta_1 P_i + g(X_i - c) + v_i,$$

where e_i is years of schooling for the individual i, P_i is a dummy variable that takes the value 0 for individuals born in or before 1986 and 1 for those born after 1986. Since individuals born after 1986 were mainly exposed to the 1997 reform considering five years of elementary school and age 6 as the mandatory primary school enrollment age, 1986 was selected as the policy instrument following Harmon and Walker (1995) and Oreopoulos (2006). In equation (2), the estimated coefficient δ_1 on the treatment variable determines the reform's average causal impact on schooling at the threshold *'c'* (1986).

The reduced model estimates the relationship between the log of annual earnings $(Ln(w_i))$ on the treatment variable P_i and a biquadratic function of school cohort X_i :

(3) $$Ln(w_i) = \beta_0 + \beta_1 P_i + g(X_i - c) + v_i.$$

In equation (3), the estimated coefficient β_1 on the treatment variable determines the reform's average causal impact on annual earnings at the threshold 'c' (1986).

Returns to mandatory schooling are calculated by the two-stage least squares (2SLS) applying the below model:

(4) $$Ln(w_i) = \theta_0 + \theta_1 e_i + g(X_i - c) + v_i,$$

where the assignment variable e_i is included as an instrument for schooling. If the returns to mandatory education are heterogeneous, $\hat{\theta}_1$ can be interpreted as calculating the returns to mandatory education of ones who are exposed to the education reform.

In addition to Harmon and Walker (1995) and Oreopoulos (2006), Imbens and Angrist (1994), Heckman and Cameron (2001), and Lang (1993) emphasized the 2SLS and interpreted it as the local average treatment effect (LATE), which is the average treatment effect for those individuals who comply with the treatment assignment due to the instrument (i.e., compliers). Therefore, according to the aforementioned studies, 2SLS has a treatment effect for individuals who are exposed to the treatment.

On the other hand, if there is heterogeneity in the parameter of interest, LATE could differ from the Average Treatment Effect (ATE), which is the average treatment effect for the entire population, assuming that everyone in the population could receive the treatment. According to the mentioned studies, as the sample of those who are exposed to the treatment increases, the LATE estimates and the ATE estimates converge. Because as the proportion of compliers increases (i.e., as the sample of those exposed to

the treatment gets larger), the LATE may converge to the ATE if the treatment effect for compliers becomes more representative of the treatment effect for the entire population. This convergence would depend on the extent to which the treatment effect for compliers is similar to that for non-compliers and the overall population. If the treatment effects are highly heterogeneous and the compliers are not representative of the entire population, the LATE and ATE may differ even as the sample size increases.

1.5. RESULTS

Focusing on a sample of women, I examine the impact of the 1997 education reform of Türkiye. Considering the cohort born before 1986 as the control group and the cohort born after 1986 as the treatment group, it is clearly evident that education reform has a statistically significant and positive impact on the return to education for females. In addition, the education coefficient in Model 3 can be interpreted as the local average treatment effect of the education reform. The coefficient is statistically significant and positive. Clearly, the 1997 education reform had a strong impact on labor market outcomes for females (*Table 3*).

Table 3: Estimated Effect of Mandatory Schooling Reform on Wages for Females

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
edu	0.0655***	0.0814***	0.0522***
	(0.00101)	(0.00171)	(0.00141)
exp	0.00591***	0.0409***	0.0354***
	(0.00196)	(0.00248)	(0.000836)
exp2	-0.000136***	0.000487***	-0.000686***
	(3.07e-05)	(0.000119)	(1.71e-05)
Constant	7.067***	6.344***	6.862***
	(0.0359)	(0.0281)	(0.0237)
Observations	17,950	10,906	28,856
R-squared	0.358	0.193	0.277

A similar relationship between the 1997 education reform and labor market outcomes also holds for males. Considering the cohort born before 1986 as the control group and the cohort born after 1986 as the treatment group, it is clearly evident that education reform has a statistically significant and positive impact on the return to education for males. In addition, the education coefficient in Model 6 can be interpreted as the local average treatment effect of the education reform. The coefficient is statistically significant and positive. Clearly, the 1997 education reform had a strong impact on labor market outcomes for males (*Table 4*). Compared with males, the impact of the 1997 reform on female wages is significantly greater.

Table 4: Estimated Effect of Mandatory Schooling Reform on Wages for Males

VARIABLES	(1) Model 4	(2) Model 5	(3) Model 6
edu	0.0587***	0.0682***	0.0495***
	(0.000544)	(0.000995)	(0.000850)
exp	0.0211***	0.0359***	0.0406***
	(0.00121)	(0.00170)	(0.000533)
exp2	-0.000337***	0.000418***	-0.000693***
	(1.95e-05)	(7.87e-05)	(1.07e-05)
Constant	7.084***	6.648***	6.941***
	(0.0206)	(0.0163)	(0.0132)
Observations	41,955	21,352	63,307
R-squared	0.299	0.196	0.272

squares model, with the 1997 reform being the instrumental variable. The education coefficient in Model 6 can be interpreted as the local average treatment effect.

1.6. POLICY IMPLICATIONS AND CONCLUSION

Education has been the basic human right since the adoption of the Universal Declaration on Human Rights in 1948. Education serves not only as a key to personal empowerment but also as a tool with significant practical benefits. Education enhances human capital, productivity, and income, while also improving job prospects and driving economic expansion. Beyond these financial advantages, education contributes to better health outcomes and empowers individuals with greater autonomy in their lives. Furthermore, it fosters trust, strengthens social bonds, and lays the foundation for inclusive institutions that support collective well-being and prosperity.

Many developmental challenges stem from a lack of education. Having the population education is the backbone of being a rich country. As William Easterly highlights in "The Elusive Quest for Growth" that no country has achieved high-income status with an entirely unskilled workforce (Easterly 2002). Furthermore, education serves as a fundamental pillar in the attainment of virtually all other developmental milestones. Furthermore, basic education enhances the productivity of all workers, while advanced education and training are imperative for nations to advance their production techniques and outputs (World Economic Forum 2016).

Since there are strong links between investment in education and economic development, countries make some improvements in their education systems from time to time. Türkiye's national education system has also undergone significant changes in the last 30 years. Two of the most impactful changes in Türkiye's national education system were made in 1997 and 2012. In 1997, the Turkish government extended mandatory years of schooling for five years to eight years. In addition, secondary education became mandatory for all students in 2012. Therefore, a person should have at least 12 years of education.

The extension of mandatory schooling years in 1997 and the requirement for secondary education in 2012 are significant policy changes aimed at improving educational attainment in the country. As previously noted, the cohort born after 1986, who benefited from the 1997 reform, experienced higher returns to education, which is reflected in their wages compared with those born before 1986 with the same level of education and experience.

Apart from the aforementioned education reforms, almost all the governments changed some parameters in the education system in Türkiye. Considering the schooling impact of the 1997 education reform in Türkiye, there is a substantial impact of the reform on schooling in Türkiye. In particular, those impacted by the reform, that is the cohort born after 1986, have profound increases in returns to education. In other words, wages of those born after 1986 are significantly higher than those born before 1986, even if they have the same education and experience levels. This is noteworthy because it shows the effects of education policy on labor market outcomes. Unfortunately, the analysis presented in this chapter only reveals the impact of schooling. This chapter does not focus on the quality of education aspect of the reforms. The quality of education is equally important. High-quality education can enhance cognitive skills, foster innovation, and improve the adaptability of the workforce, which in turn can lead to better economic outcomes.

The effects of changes in education quality may take more years to be observed in the labor market. Therefore, it is vital to keep in mind that schooling boosts labor market outcomes. Longitudinal studies and continued research are necessary to fully understand the long-term impacts of both the quantity and quality of education on individual earnings and broader economic development in Türkiye. It is also important to consider other factors that might influence labor market outcomes, such as economic policies, labor market regulations, and global economic trends. For instance, the level of education of a generation in Türkiye is closely linked to the educational background of parents (Tansit 2015). This creates a path dependence in educational outcomes. To break the path dependence, Turkish government needs to carefully design education curriculum and policies. Moreover, increasing number of universities in Türkiye will have some benefits for access to education while it dampens the quality of education.

Finetuning the right balance between education quality and schooling will boost country's human capital and thus, its development.

CHAPTER 2

HUMAN CAPITAL WEALTH IN TÜRKİYE

"Schooling and education are not synonymous: the educational content of time spent at school ranges from superb to miserable".

Jacob A. Mincer (1974), Schooling, Experience, and Earnings

"The concept of human capital is based on an analogy between investment in physical capital and investment in human beings. The common element is that present expenditures yield returns over the future."

Dale W. Jorgenson and Barbara M. Fraumeni (1989), The Accumulation of Human and Nonhuman Capital, 1948 -84.

2.1. INTRODUCTION

Human capital is the key asset for a country. It encompasses the knowledge, skills, and experience that individuals mount up throughout lifetimes, which can contribute to economic growth, innovation, and the overall development of a society. Investing in human capital, through education, health care, and other means, is essential for addressing development challenges and improving the quality of life for people around the world. By enhancing the capabilities and productivity of individuals, countries can

create a more skilled workforce that is capable of driving progress and adapting to the changing demands of the global economy.

Human capital wealth can be defined as the monetary value of the value of skills, experience, and effort by the working population over their lifetime. One of the benefits of having such a metric is to represent material well-being of a country. Even though human capital wealth is quite a nascent metric of the sustainability for economic development, it has broader implications than per capita income measures.

Human capital stands as key piece of global wealth. According to the World Bank, human capital accounts for 64 percent of global wealth. However, its contribution to total wealth significantly differs among income groups. While human capital constitutes about two-thirds of wealth in high-income economies and upper-middle-income countries, it accounts for only half of wealth in low-income economies (World Bank 2021). In addition, differences in human capital account for a significant portion of economic growth and cross-country per capita income differences. This underscores the importance of investing in people—through education, health, and other means—to foster economic development and improve overall well-being. The value of human capital is recognized for its potential to generate economic returns and drive sustainable growth, making it a critical area of focus for policymakers and governments worldwide.

Education plays a key role in investing people. On an individual level, education equips people with the knowledge and skills necessary to participate effectively in the labor market, leading to better employment opportunities and higher earning potential. This, in turn, can lead to improved standards of living and personal growth. On a societal level, education contributes to the development of a skilled workforce that is capable of driving innovation, productivity, and competitiveness. A well-educated population is better able to engage in complex problem-solving and adapt to technological changes, which are critical for economic growth and development. Furthermore, education has a multiplier effect; it can lead to better health outcomes, reduced poverty, and greater civic participation, all of which contribute to the overall well-being and resilience of a society. By investing in education, countries can create a virtuous cycle of growth and development that benefits all members of society.

In this chapter, I focus on human capital wealth in Türkiye. My research question for this chapter is how Türkiye's human capital wealth has evolved since 2004. Even though Türkiye has a great potential in her youth, the literature does not shed light on how Türkiye can benefit from this potential. To do that measuring the human capital wealth stock is a crucial step. Using microdata from the Household Labor Force Survey (HLFS) from Turkstat, I estimate Türkiye's human capital wealth since 2004 using the lifetime income approach. Hence, human capital is computed as present value of the expected earnings within a country.

2.2. LITERATURE

The literature is abundant on methodologies for calculating human capital. This section includes a brief summary of the existing literature.

Indicators-based approach: This method uses physical measures such as years of schooling, educational attainment, class size, and test scores to estimate human capital. It often relies on the average number of years of schooling as a proxy, but this can overlook the quality of education. It can be challenging to develop a common metric due to the reliance on multiple indicators (e.g., Ederer et al. 2007 and 2011).

Monetary measure-based approach: This can be divided into direct and indirect methods: In the indirect approach, human capital is computed through the present value of future benefits. The World Bank's *'Where is the Wealth of Nations'* report exemplifies this approach by using future consumption expenditures as a proxy for total wealth and determining human capital as the residual. However, this method can accumulate measurement errors and overlook non-market benefits.

The direct approach can be divided into two sub-methods. This includes cost-based, income-based, and indicators-based measures:

1. **Cost-based approach:** Accounts for all costs incurred in producing human capital, considering it as the sum of past investments. It's straightforward

but only considers production costs, not demand and supply factors ((e.g., Kendrick 1976 and Eisner 1985),

2. **Income-based approach:** Estimates human capital based on the potential future earnings from human capital investments, thus focusing on the output side of human capital (e.g., Jorgenson and Fraumeni 1989, 1992a, 1992b).

Each of these approaches has its own strengths and limitations, and the choice of method can depend on the specific objectives of the analysis, the availability of data, and the context in which human capital is being assessed.

The United Nations Inclusive Wealth Report 2018 measures human capital wealth stock for countries using an indicator-based approach. In this method, human capital is computed as the average years of schooling from the Barro-Lee dataset. The previous versions of the abovementioned report were also based upon the Barro-Lee dataset while calculating monetary estimates of human capital wealth (Managi and Kumar 2018).

According to the 'Inclusive Wealth 2018' report, per capita human capital wealth of Türkiye rose from 17,600 US$ (in constant 2005 US$) in 1990 to 21,400 US$ (in constant 2005 US$) in 2014 (*Figure 1*). While human capital wealth constituted about 45.3 percent of the total inclusive wealth of Türkiye in 1990, its share dropped to 42.3 percent of the total inclusive wealth in 2014 (*Figure 2*).

Figure 1: Human Capital Wealth per Capita in Türkiye
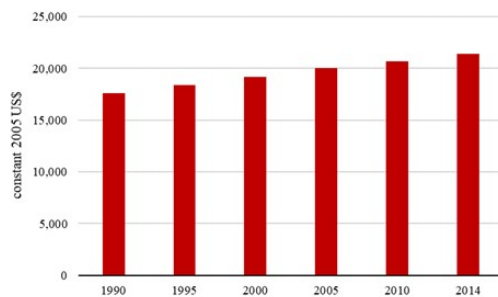
Figure 2: Share of Human Capital Wealth in Türkiye's Inclusive Wealth

Source: United Nations Inclusive Wealth Report 2018.
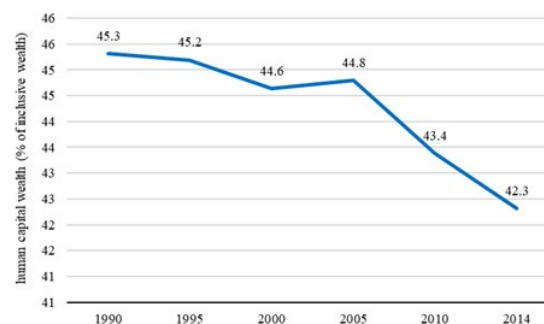
Source: United Nations Inclusive Wealth Report 2018.

The World Bank's 'Changing the Wealth of Nations 2018: Building a Sustainable Future' report (hereafter CWON 2018) utilizes the lifetime income approach to compute human capital wealth (Lange et al. 2018). This was a significant undertaking as it represented the first time such a comprehensive measurement was attempted on this scale. The methodology employed in the report highlights the importance of human capital as a component of national wealth and emphasizes the value of investing in people for sustainable economic development.

According to the 'Changing the Wealth of Nations 2018' report, per capita human capital wealth of Türkiye rose from 9,551 US$ (in constant 2014 US$) in 1995 to 12,081 US$ (in constant 2014 US$) in 2014 (*Figure 3*). While human capital wealth constituted about 21.1 percent of the total wealth of Türkiye in 1995, its share rose to 26.3 percent of the total wealth in 2014 (*Figure 4*).

Figure 3: Türkiye's per Capita Human Capital Wealth (2018 Database)
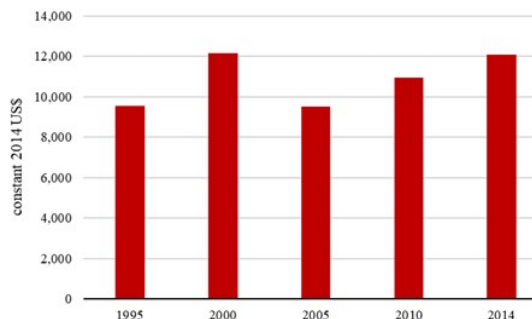
Source: World Bank Wealth Accounting Database 2018.

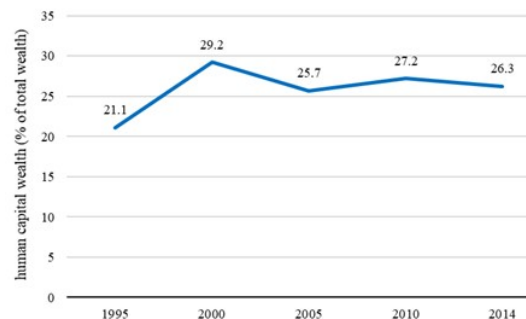**Figure 4: Share of Türkiye's Human Capital as a percent of Total Wealth (2018 Database)**

Source: World Bank Wealth Accounting Database 2018.

The World Bank's 'Changing the Wealth of Nations 2021: Managing Assets for the Future' report (hereafter CWON 2021) extended the country coverage to 146 countries and extended the period to 2018. CWON 2021 also applied the methodology developed for CWON 2018. According to the CWON 2021, per capita human capital wealth of Türkiye rose from 5,005 US$ (in constant 2018 US$) in 1995 to 11,212 US$ (in constant 2018 US$) in 2014 (*Figure 5*). While human capital wealth constituted about 20.2 percent of the total wealth of Türkiye in 1995, its share rose to 23.5 percent of the total wealth in 2018 (*Figure 6*). Significant variations in human capital wealth exist between the Inclusive Wealth and Wealth of Nations reports. Methodological difference between the two reports is the main reason for the human capital wealth difference. Moreover, there are substantial differences between CWON 2018 and CWON 2021, even though both reports apply the same methodology in estimating human capital wealth.

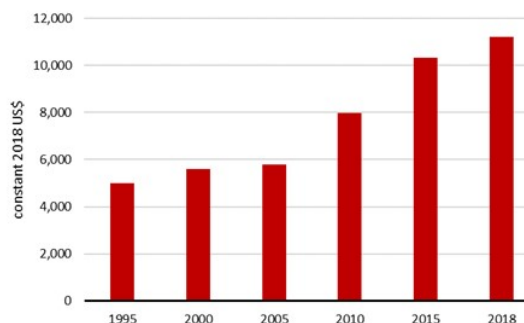**Figure 5: Türkiye's per Capita Human Capital Wealth (2021 Database)**

Figure 6: Share of Türkiye's Human Capital as a percent of Total Wealth (2021 Database)
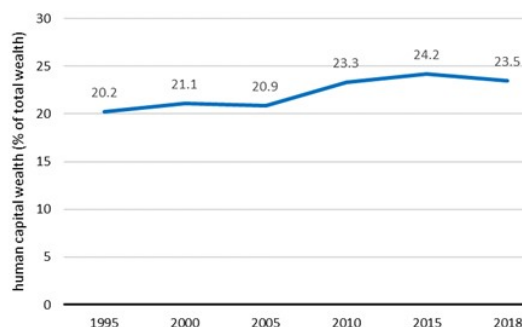

Source: World Bank Wealth Accounting Database 2021.

Source: World Bank Wealth Accounting Database 2021.

2.3. DATA AND METHODOLOGY

2.3.1. Data

Constructing a database is the foremost step in working with data. The database contains information on population, employment, survival rates, GDP, and Labor shares. In addition, relevant indicators such as population and employment are classified by age and gender.

I have received annual data of the Household Labor Force Survey (HLFS) from the Turkish Institute of Statistics (TUIK). The HLFS dataset compiles demographic details such as age, gender, marital status, household composition, place of living, and education. In addition to demographic data, the survey primarily collects key information on employment, sector of employment, and earnings. Assigning population weights to each observation in the data ensures that our descriptive statistics and regressions are representative of the national population. Since the surveys during 2000-2003 exclude the necessary information to calculate the wage regressions, I used the surveys from 2004 to 2020. Therefore, the human capital wealth calculation in this chapter is for the period 2004-2020.

Other data sources are as follows: Employment rates are obtained from the International Labor Organization (ILO) to control and upscale employment from the microdata. GDP data are obtained from the United Nations National Accounts database to check earnings from the microdata. Labor share of GDP is obtained from the Penn World Table (version 10.01) to control the estimated wages from the microdata. Survival rates are calculated using the death rates, which are reported by the Institute for Health Metrics and Evaluation.

2.3.2. Methodology

In this section, the lifetime income methodology, as described by Jorgenson and Fraumeni in their works from 1989-1992, is used to calculate human capital wealth. This method estimates human capital wealth as the cumulative present value of expected future Labor income over the lifespan of a country's current population.

The step-by-step application of the lifetime income approach is as follows:

Step 1: Modeling earnings regressions. The Household Labor Force Survey (HLFS) is used to create a database with information on earning profiles, education and schooling profiles, and some labor market-related indicators. Hence, the Mincerian coefficients are estimated using the Mincerian wage regressions as follows:

(5)
$$Ln(w_i) = \alpha + \beta_1 e_i + \beta_2 X_i + \beta_3 X_i^2 + \mu_i$$

where $Ln(w_i)$ is the natural logarithm of the annual earnings, which are used to linearize the relationship between earnings and explanatory variables, e_i is years of schooling or education level, X_i represents potential working experience, X_i^2 is the square of potential experience, included to capture the nonlinear relationship between experience and wages (reflecting the idea that the returns to experience may increase at a decreasing rate), and μ_i is the error term, capturing the variation in wages not explained by education and experience.

The return to education is captured by β_1 coefficient as the returns to potential working experience is estimated by the coefficients β_2 and β_3. Moreover, the constant α estimates the average incomes (in logarithm) of persons with no education and no labor market experience

The equation is estimated separately for every year and for both genders to capture the potential differences in returns to education and experience by sex. The results of such a regression can provide insights into the value of education and experience in the labor market and how these returns may differ across groups and over time.

The matrix of expected earnings, H, is made from the coefficients obtained from the Mincerian regressions, representing the expected earnings for individuals with different levels of education and experience. The matrix symbolizes the distribution of labor earnings among various groups within the population. Each cell in the matrix, H, corresponds to the expected labor earnings for individuals of a certain age '*a*', sex '*s*', and education level '*e*'. If $n_{s,a,e}$ is the number of workers of age '*a*', sex '*s*', and years of schooling '*e*', then each cell matrix H can be defined by the expected earnings for that particular group.

(6)
$$H_{s,a,e} = n_{s,a,e}\exp\left(\beta_1 e + (\beta_2 + \beta_3 X_{s,a,e})X_{s,a,e}\right)$$

Thus, matrix H would be a multidimensional array with dimensions corresponding to age, sex, and education level, where each entry in the matrix is the expected earnings for the group defined by these three characteristics.

Step 2: Distinguish earnings by employment. Surveys often struggle to distinguish between labor income and capital income for the self-employed because their income typically includes returns on both labor and capital investments. This is particularly true in sectors like agriculture, where self-employed workers may not have significant fixed assets, and their income is largely generated from their labor.

In low-income countries, where agriculture is a dominant sector and many workers are self-employed, the labor share of value added is often high. However, surveys may not capture this accurately because of the difficulty in separating income sources, and the seasonal and variable nature of agricultural income. The System of National Accounts (SNA) typically includes formal employment in its calculations, which can cause an undervaluation of the total labor earnings when a large portion of the workforce is self-employed or working in the informal sector. As a result, there can be discrepancies between the earnings reported in surveys and the actual share of labor earnings in GDP.

To address these challenges, researchers and policymakers often use various methods and adjustments to estimate the labor and capital components of self-employed income more accurately. These methods may include using additional data sources, making assumptions based on industry standards, or applying econometric models that attempt to separate the two types of income.

Understanding these nuances is crucial for economic analysis and for designing policies that effectively target the self-employed and agricultural sectors. It is also important for international organizations and national statistical offices to continuously improve survey methodologies and data collection techniques to better capture the complexities of labor income, particularly for the self-employed in various sectors.

The Penn World Tables provides a "best estimate" of the labor share by considering the income of both employees and the self-employed, and it adjusts account for differences in the way labor income is reported in different countries.

When survey data are used to estimate earnings profiles, they often only include wages and do not account for other benefits such as pensions and allowances attached to wages. This can lead to discrepancies when comparing survey data with the more comprehensive data from the SNA, which includes each form of compensation.

To address these discrepancies, earnings profiles obtained from surveys are aligned with compensation figures for both employees and the self-employed from the Penn World Table (PWT). This benchmarking process involves scaling up survey earnings to match

the level of earnings in the national accounts. The relative wages across different groups or over time, rather than the absolute values, are significant here because the relative figures can provide insights into the distribution of earnings and labor market dynamics, even if the absolute levels are not directly comparable due to the exclusion of non-wage benefits in the survey data.

Using data from the Penn World Tables, earnings by employment can be estimated as

(7)
$$W = comp_{employ} + comp_{self} = LABSII * GDP$$

(8)
$$comp_{employ} = LABSH_{employ} * GDP$$

(9)
$$comp_{self} = LABSH_{self} * GDP$$

(10)
$$H_{s,a,e\,employ} = comp_{employ} * \frac{H_{s,a,e}}{\Sigma_{s,a,e} H_{s,a,e}}$$

(11)
$$H_{s,a,e\,self} = comp_{self} * \frac{H_{s,a,e}}{\Sigma_{s,a,e} H_{s,a,e}}$$

where $LABSH$ stand for compensation of labor in GDP. Portions of employees and self-employed in total compensation represented by $LABSH_{employ}$ and $LABSH_{self}$, respectively. Therefore, equations (10) and (11) correspond to the matrices of expected incomes of the employees of age 'a', sex 's', and education level 'e' and that of the self-employed of age 'a', sex 's', and education level 'e'. In addition, equations (10) and (11) include the scaling parameter. The terms ($comp_{employ}$ / $\Sigma_{s,a,e} H_{s,a,e}$) and ($comp_{self}$ / $\Sigma_{s,a,e} H_{s,a,e}$) denote the scaling parameters for the compensations of employees and self-employed. Consequently, the methodology outlined in equations (7) through (11) serves to break down earnings by employment type, effectively adjusting labor earnings to align with the figures reported in the national accounts.

Step 3: Upscaling the employment and population matrices. To ensure comprehensive estimates, employment and population data from surveys are expanded to align with United Nations population figures, as survey data alone may not represent the entire population.

Step 4: Calculate lifetime income. The method employed here differentiates between the potential for further education in the 15-24 age group and the assumption of completed education in the 25-65 age group. This differentiation is fundamental to the calculation of an individual's lifetime labor income.

Persons aged 25-65

(12)
$$h_{s,a,e} = p^m_{s,a,e} w^m_{s,a,e} + p^s_{s,a,e} w^s_{s,a,e} + d * v_{s,a+1} * h_{s,a+1,e}$$

Persons aged 15-24

(13)
$$h_{s,a,e} - p^m_{s,a,e} w^m_{s,a,e} + p^s_{s,a,e} w^s_{s,a,e} + \left(1 - r^{e+1}_{s,a,e}\right) * d * v_{s,a+1} * h_{s,a+1,e} + r^{e+1}_{s,a,e}$$
$$* d * v_{s,a+1} * h_{s,a+1,e+1}$$

where $h_{s,a,e}$ is the present value of the lifespan income for a person with age of 'a', sex 's', and education of 'e'. $p^m_{s,a,e}$ is the probability to be employed, $w^m_{s,a,e}$ is the employment earnings, $p^s_{s,a,e}$ is the probability to be self-employed, $w^s_{s,a,e}$ is the earnings for self-employed. Finally, $r^m_{s,a,e}$ is the school enrolment ratio, d is the discount factor and v_{a+1} is the survival ratio.

Equations (12) and (13) imply that an individual's total earnings over their lifetime are made up of their present wage or business income, along with their projected earnings for the following year. The present income is modified based on the likelihood of being employed or running one's own business, while the projected income for the coming period is modified by both a discount factor and the probability of surviving to that

period. Moreover, for individuals between the ages of 15 and 24, there are two potential paths: one is to maintain their current level of education and continue working, and the other is to pursue an additional year of education with the expectation of earning an income after completing their studies.

The likelihood of being employed ($p_{s,a,e}^{m}$) or self-employed ($p_{s,a,e}^{s}$) can be estimated using the employment and self-employment rates for persons characterized by age of *'a'*, sex *'s'*, and education of *'e'*. These ratios are computed by dividing the number of employed individuals by the total population, which includes those who are employed, self-employed, unemployed, and not part of the labor force. The proportions derived from the Household Labor Force Survey serve as the basis for these calculations.

The execution of equations (12) and (13) in practice uses a backward iteration strategy. This implies that the lifetime earnings for a person at age 65 is assumed zero, based on the assumption that they will no longer be part of the workforce after reaching this age. As a result, the lifetime earnings for someone at age 64 is simply her current labor earnings. In the case of a person who is 63 years old, her lifetime labor income is calculated as the total labor earnings in addition to the estimated current value of future labor income for an individual who is 64 years old. This process of backward recursion is applied to equations (12) and (13) to generate this value of the lifetime income matrix across the economy.

Step 5: Producing lifetime income for population. The process from the first to the sixth step produces estimates of lifetime earnings for a typical person, categorized by age, sex, and educational background. These estimates are then scaled up by the population count in each category within a nation, resulting in the calculation of the nation's human capital value, broken down by age, sex, and education. By adding together, the human capital values from all these categories, the total estimated worth of a country's human capital is obtained.

$$(14) \qquad HC - \sum_{s,a,e} [h_{s,a,e}] * pop_{s,a,e}$$

2.4. RESULTS

The theory of human capital has so far resulted in one common conclusion about the relationship between schooling and wages: As schooling increases, wages increase (MacDonald 1981). Psacharopoulos (1981 and 1985) found that private returns to primary education slightly decline over time, and returns are highest for primary education. Moreover, Psacharopoulos and Patrinos (2004) suggested that private returns to higher education have been increasing. Therefore, the coefficients in the Mincerian earnings regression play a significant role in human capital wealth.

Return to education for both males and females has been steadily declining in Türkiye since 2013. It is observed that return to education for females has always been higher than that for males. Both series followed similar trends during 2004-2020 (*Figure 7*). However, return to experience for males was higher than that for females as both series followed similar trends during the mentioned period (*Figure 8*).

According to the results of the Mincerian earnings regressions, additional schooling increases individual earnings of females by approximately 8.7 percent (2020), while it increases individual wages of males by approximately 7.5 percent (2020). On the other hand, when 2004 coefficients are considered, additional schooling increases individual earnings of females by approximately 10.3 percent (2004), while it increases individual wages of males by approximately 8.1 percent (2004). Therefore, it can be inferred that changes in education policy in the last 30 years did not contribute to individual wages. On the contrary, the sensitivity of individual wages with respect to education has declined.

Similar trends are observed in return to experience. Considering the 2004 HLFS results, one additional year of experience increases individual wages of males by approximately

5.7 percent (2004), while it increases individual wages of females by approximately 3.4 percent (2004). When the 2020 HLFS results are taken into consideration, one additional year of experience increases individual wages of males by around 4.2 percent (2020), while it increases individual wages of females by around 3.5 percent (2020).

Figure 7: Returns to Education in Türkiye

Source: Author's calculation using Turkish Household Labor Force Surveys.
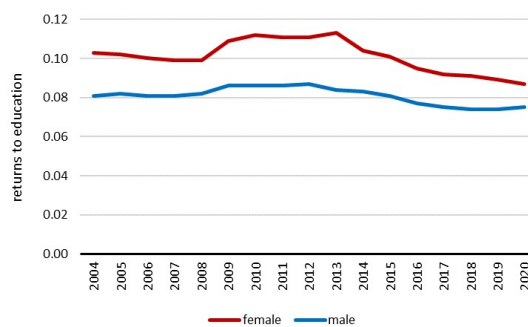
Figure 8: Returns to Experience in Türkiye
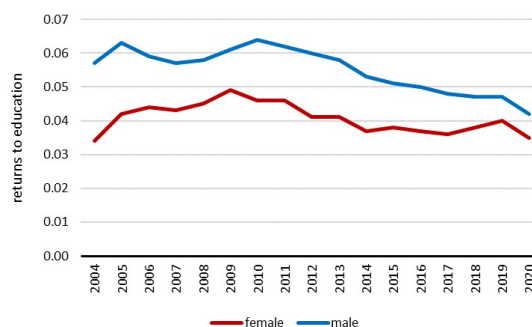
Source: Author's calculation using Turkish Household Labor Force Surveys.

Figure 9: Human Capital per Capita in Türkiye (constant 2022 US$)
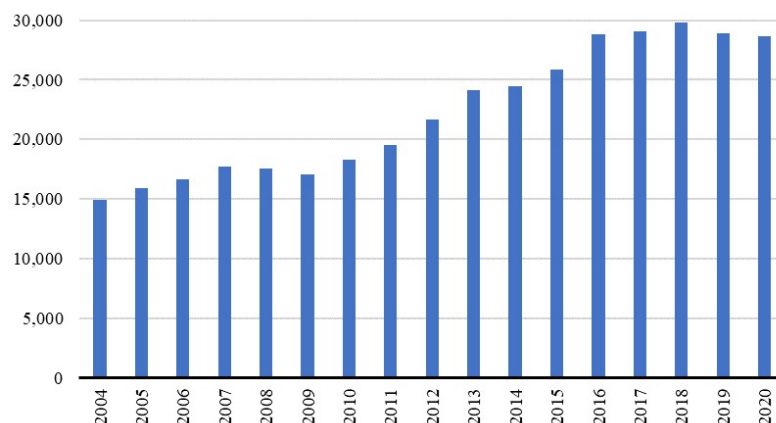
Source: Author's calculation.

Based on the data and methodology provided in Section 3, the human capital wealth stock of Türkiye is calculated for the period of 2004-2020. All figures are represented in 2022 constant US dollars to simplify the comparison. The change in per capita human capital wealth stock in Türkiye is illustrated in Figure 9. One of the most noticeable

observations is that per capita human capital's trajectory was stagnant for the period of 2004-2010, and a stable increase over 2010-2016, finally stagnant again during 2016-2020. While human capital wealth per capita was about 15,000 US$ (in 2022 prices) in 2004, it was calculated as 28,618 US$ in 2020. Per capita human capital wealth stock peaked in 2018, reaching just below US$30,000.

2.5. POLICY IMPLICATIONS AND CONCLUSION

Unlike natural and physical capital, which can be depleted, human capital can grow and improve over time through education, training, and health investments. Measuring a country's human capital stock is crucial for understanding the potential for economic growth and development. It also allows policymakers to assess the effectiveness of existing policies and make informed decisions to improve the quality and productivity of the workforce. By investing in human capital, countries can foster innovation, enhance the skills of their population, and ultimately drive sustainable economic progress. As long as a country invests in human capital, sustainable development can be achieved. Therefore, it is important to measure a country's human capital stock and analyze the impacts of existing policies.

Based on the lifetime income approach developed by Jorgenson and Fraumeni (1989, 1992a, 1992b), Türkiye's human capital wealth per capita has sputtered since 2016. During the 2004-2020 period, stagnation in Türkiye's human capital wealth was quite common, and this was disheartening. This is important because Türkiye has experienced many education reforms in the last 30 years, and it seems that these policies have worsened labor market outcomes. I only focused on Türkiye's human capital wealth in this chapter but considering the income-level averages in the CWON reports, Türkiye fell behind its peers in human capital stock (*Figure 10*). Even though Türkiye is an upper-middle-income country, per capita human capital wealth in Türkiye is less than the average of lower-middle-income countries. In addition, per capita human capital wealth in Türkiye is less than half of the European and Central Asia (low and middle-income countries) region average.

Figure 10: Human Capital per Capita in the Selected Income Groups and Türkiye
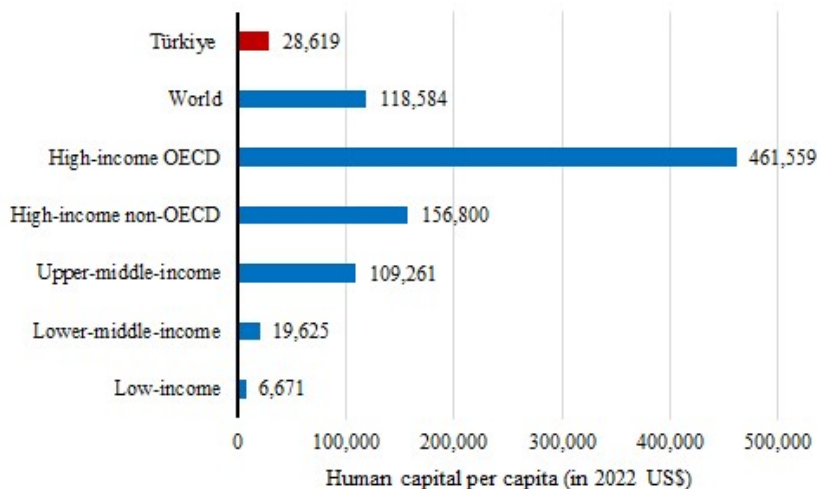
Source: Author's calculation and the World Bank Wealth Accounting Database.

Notes: 1- 2020 data for Türkiye and 2018 data for other groups. 2-Human capital wealth is calculated in 2022 US Dollars.

Since there are strong links between investment in education and economic development, countries make some improvements in their education systems from time to time. Türkiye's national education system has also undergone significant changes in the last 30 years. Two of the most impactful changes in Türkiye's national education system were made in 1997 and 2012. In 1997, the Turkish government extended mandatory years of schooling for five years to eight years. In addition, secondary education became mandatory for all students in 2012. Therefore, a person should have at least 12 years of education.

The extension of mandatory schooling years in 1997 and the requirement for secondary education in 2012 are significant policy changes aimed at improving educational attainment in the country. Apart from these two radical reforms, almost all governments changed some parameters in the education system in Türkiye. However, we understand from the results that returns to education have been worsening for both males and females in Türkiye (*Figure 7*). This is noteworthy because it shows the effects of education policy on Labor market outcomes. Unfortunately, the importance of education has been declining in Türkiye for many years, and this chapter empirically reveals this fact. Investing in human capital is the most important problem in Türkiye. While we

miserably rely on our country's human capital, each subsequent generation has been even more miserable.

CHAPTER 3

IMPACT OF SMOKING ON HUMAN CAPITAL WEALTH IN TÜRKİYE

"Productivity isn't everything, but, in the long run, it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker. (...) So the only way in which sustained, long-term growth in living standards can be achieved is by raising productivity. Real consumption per capita in the United States today is about four times what it was at the turn of the century; so is productivity."

Paul Krugman (1997), The Age of Diminished Expectations

"Consider the 35-fold difference in output per worker between the United States and Niger. Different capital intensities in the two countries contributed a factor of 1.5 to the income differences, while different levels of educational attainment contributed a factor of 3.1."

Robert E. Hall and Charles I. Jones (1999), Why Do Some Countries Produce So Much More Output Per Worker Than Others?

3.1. INTRODUCTION

Human capital contains a broad range of factors that contribute to the productivity and capabilities of individuals within a workforce. Education and training are key components, as they enhance a person's skills and knowledge. However, human capital also includes health, as a healthy individual is more likely to be productive and capable of learning. Additionally, health habits play a role in maintaining an individual's overall well-being and ability to contribute effectively to the workforce.

Good health enables individuals to work more efficiently and effectively. When people are healthy, they are less likely to be absent from work due to illness, and they are better able to focus and perform their job responsibilities. So, good health boosts productivity. Good health is also essential for effective learning and skill development. It allows individuals to fully engage in educational and training activities, leading to the acquisition of new knowledge and skills that enhance their human capital. Moreover, maintaining good health can contribute to a longer and more productive career. Healthy individuals are more likely to remain in the workforce for a longer period, contributing their skills and knowledge over an extended period of time. Furthermore, good health can lead to lower healthcare costs for both individuals and employers, freeing up resources that can be invested in other aspects of human capital development, such as education and training. Overall, good health is a foundational element of human capital, as it underpins an individual's ability to learn, work, and contribute to the economy.

Globally, smoking and alcohol use are the world's third highest risk factors for health. Smoking is a leading cause of early mortality due to ailments like lung cancer, heart disease, stroke, emphysema, and chronic bronchitis. Similarly, excessive consumption of alcohol may lead to chronic health conditions and severe issues such as hypertension, heart disease, strokes, liver disease, and gastrointestinal disorders. In 2019, smoking and alcohol use were responsible for 10.4 million deaths globally. In other words, approximately 18.3 percent of global deaths were due to these two risks. Causing 7.7 million deaths in 2019, smoking was the second highest risk factor, while alcohol use was responsible for approximately 2.4 million deaths (*Figure 11*).

Smoking is particularly harmful to human health, with a strong association with non-communicable diseases such as lung cancer and stroke. The Global Burden of Disease Study Collaborative Network in 2020 highlighted these links. Unfortunately, Türkiye is one of the countries where smoking is pervasive and where people who smoke consume a large quantity of cigarettes.

Figure 11: Number of Deaths by Risk Factor, 2019
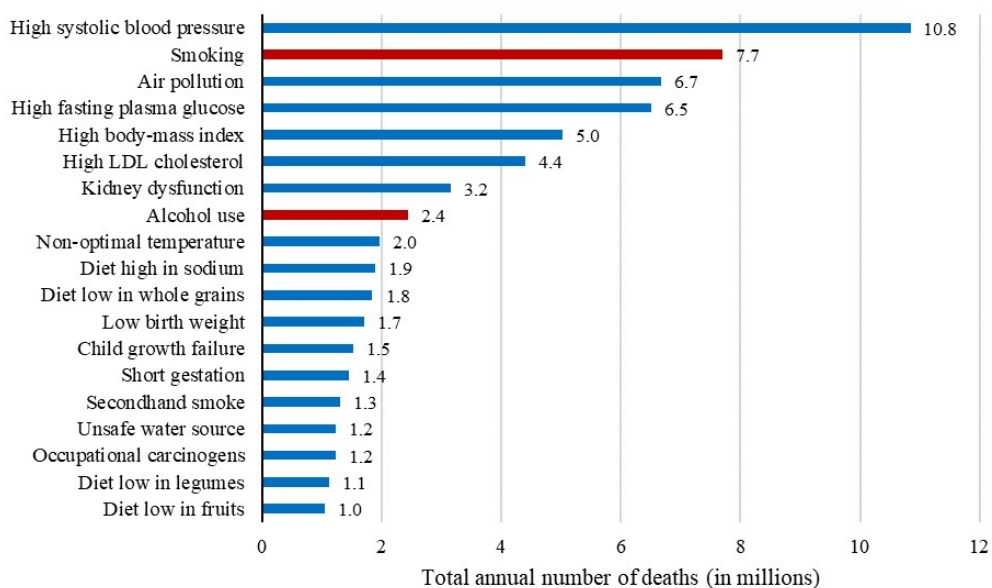
Source: Institute for Health Metrics and Evaluation.

Note: The figure illustrates major risk factors.

Accounting for approximately one-third of total deaths, smoking was the second leading risk factor for health in Türkiye following high systolic blood pressure. Smoking was responsible for approximately 100,000 deaths in Türkiye in 2019 (*Figure 12*). On the other hand, alcohol use is responsible for a small fraction of the total deaths in Türkiye, even though it is one of the leading global risk factors.

Figure 12: Number of Deaths by Risk Factor in Türkiye, 2019
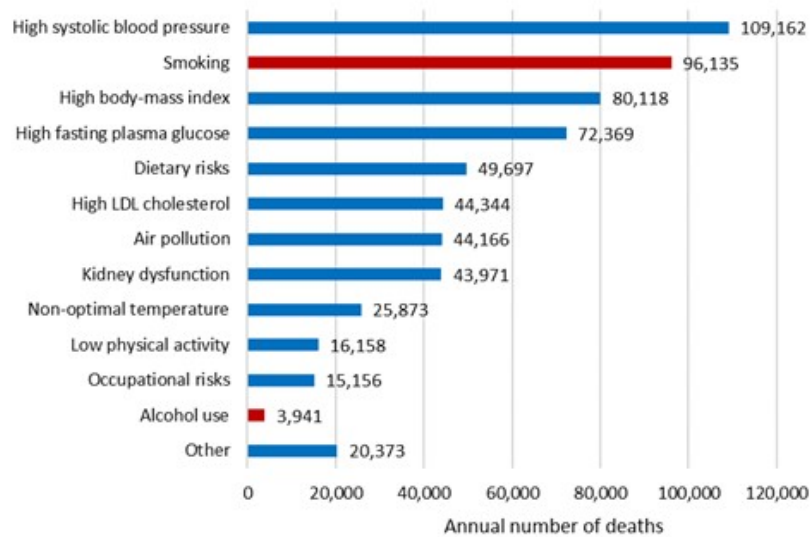
Source: Institute for Health Metrics and Evaluation.

Due to lack of measurement models in the literature on the indirect effects of smoking on human capital, this study focuses on the observable impact of smoking on human capital. In other words, measuring the exact impact of smoking on work efficiency and mental function is difficult, even though the mortality caused by smoking is evident. Therefore, this research centers on the immediate effects that smoking has on the premature loss of life.

The research question in this chapter is how to incorporate the impact of smoking into human capital wealth calculations, and to what extent smoking accounts for the human capital wealth loss. To that end, this chapter contributes to the literature by accounting for the impact of smoking on human capital wealth. In addition, this chapter introduces a monetary measure of impact of health risks by using well torn life-time income approach by Barbara Fraumeni and Dale Jorgenson.

3.2. METHODOLOGY

This research assesses the effect of active smoking on human capital by comparing the actual human capital in the presence of smoking-related premature deaths to a hypothetical scenario in which such deaths do not occur. This method focuses solely on

the most extreme consequence of smoking—premature mortality. While smoking can affect human capital through other means, such as diminished productivity, the research is limited to examining the impact of premature deaths. The lifetime income methodology, as described by Jorgenson and Fraumeni in their works from 1989-1992, is used to calculate human capital wealth. This method estimates human capital wealth as the cumulative present value of expected future labor income over the lifespan of a country's current population as discussed in detail throughout Chapter 2.

To estimate the impact of smoking on human capital wealth, one needs to execute the lifetime income approach as described throughout Chapter 2. Survival rate is a crucial input for human capital estimates as it indicates the probability of individuals surviving another year and consequently being part of the labor force for that additional year. In the context of human capital calculations, survival rates consider all causes of mortality, including premature deaths caused by smoking. To assess the impact of smoking on human capital wealth, premature deaths as a result of smoking are subtracted from the total death count. When the deaths due to smoking are removed from the overall number of deaths, there is an improvement in the death rates, which leads to better survival rates. Calculation of survival rates is as follows:

(15)
$$v_{a+1}^{base} = 1 - death_a^{all\ causes}$$

(16)
$$v_{a+1}^{smoking} = 1 - death_a^{excl.\ smoking},$$

where $death_a$ stands for the mortality rate at age *a,* as v_{a+1} captures the odds of surviving to next age. Thus, $death_a^{all\ causes}$ and $death_a^{excl.\ smokings}$ stand for mortality rate for all causes and mortality rate for all causes excluding smoking.

Consequently, the methodology entails executing steps 1–5 described in Chapter 2, using survival rates that account for the presence and absence of smoking. The difference between the original and adjusted human capital stocks signifies the hypothetical value of human capital wealth assuming no premature deaths attributable to smoking.

$$(17) \qquad \Delta IIC = IIC_{no\ smoking} - IIC_{with\ smoking}.$$

It is crucial to recognize that the valuation of mortality within the human capital framework employs a discounted lifetime income method. The economic cost of premature deaths due to smoking is quantified as the present value of the labor earnings that individuals who die prematurely from smoking-related diseases would have accrued throughout their remaining working life if they had not passed away. This income-focused metric differs from a welfare-based valuation of mortality, which often results in substantially higher estimates.

3.3. RESULTS

It is calculated that premature deaths attributable to smoking erodes about $66 (in 2021 constant US$) from the per capita wealth in 2020 (*Figure 13*). In other words, eliminating smoking in Türkiye would reduce premature deaths, and this in turn would boost Türkiye's human capital wealth by approximately 0.8 percent in 2020. The impact of the elimination of death caused by active smoking on human capital wealth was 1.5 percent in 1990 and 0.8 percent in 2020 (*Figure 14*).

Figure 13: Impact of Smoking on Türkiye's Human Capital Wealth
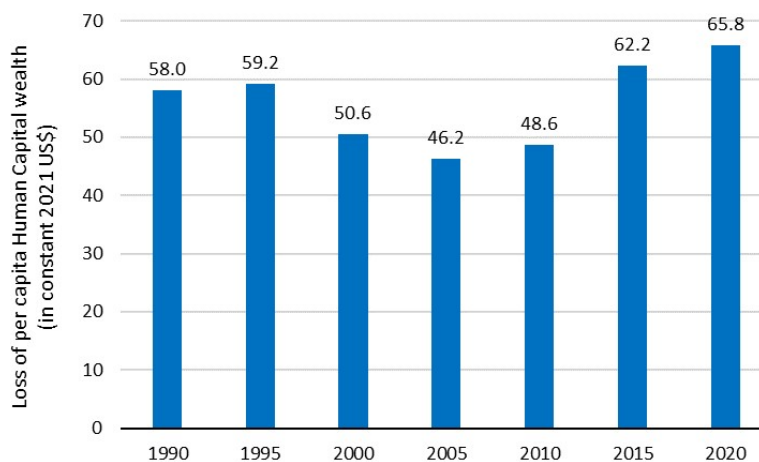
Source: Author's calculation.

The impact of smoking substantially differs between men and women. The loss of human capital wealth is higher for males than for females. The loss of human capital wealth for females is one-fifth of that of males. In 2020, the loss of males' human capital wealth due to premature deaths attributable to smoking was 1 percent of total human capital wealth, whereas the loss was 0.2 percent of total human capital wealth for females (*Figure 14*). This is due to the low female labor force participation and low female smoking rate in Türkiye. There are several other factors causing the gender disparity in human capital loss in Türkiye, including (1) careers that are interrupted for childbearing; (2) penalties for childcare, as women work part time to meet family needs and as employers question the commitment of women to their career; (3) preferences on the part of women for occupations that may be lower paid, an effect that is often reinforced by preferences for fields of study that lead to such occupations; and (4) barriers that prevent women from attaining similar economic opportunities as men. Gender discrimination fosters and reinforces many of these negative influences on women's earnings (World Bank, 2023c; Georgieva, Sayeh, and Sahay 2022).

Figure 14: Impact of Smoking on Türkiye's Human Capital Wealth, by gender
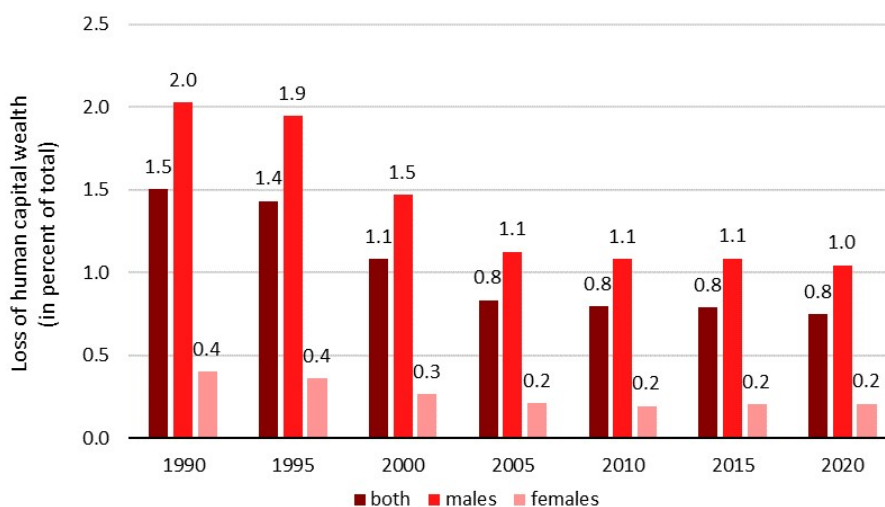
Source: Author's calculation.

3.4. DISCUSSION AND CONCLUSION

Good health is a foundational element of human capital, as it underpins an individual's ability to learn, work, and contribute to the economy. On contrary, the economic impacts of poor health on a country's workforce and productivity can be far-reaching, affecting both the individual well-being and the overall economic performance of a country. First, poor health can hinder the development of human capital by limiting individuals' ability to engage in education, training, and skill development activities. This can have lasting effects on individuals, leading to reduced earning potential and lower lifetime productivity. This can have implications for the overall economic well-being of a country. When a significant portion of the workforce is affected by poor health, overall economic output can be reduced and hence, economic growth. Additionally, poor health often leads to higher healthcare expenditures for both individuals and employers. This can place a burden on healthcare systems and reduce the resources available for other investments in human capital development.

Smoking is recognized as one of the top health risk factors globally, second only to high systolic blood pressure. Moreover, smoking has distinct adverse effects, such as impaired cognitive function, detrimental effects on children and deterioration of health of people who smoke.

While smoking does influence human capital wealth through productivity effects, quantifying the exact impact on labor productivity and cognitive abilities is challenging. This chapter quantifies the impact of smoking by comparing the actual human capital wealth, calculated under real-world smoking conditions, with a hypothetical scenario in which no premature deaths from smoking occurred in Türkiye from 1990 to 2020.

The estimates suggest that smoking has a significant negative impact on Türkiye's human capital. Premature deaths due to smoking reduce the workforce and the overall experience and skills available in the country's economy. The estimates suggest that the loss of Türkiye's per capita human capital due to premature deaths attributable to smoking was about 0.8 percent in 2020.

The gender-specific impacts—0.2 percent for females and 1 percent for males—indicate that males in Türkiye are more affected by smoking-related human capital loss than females. This could be due to higher smoking rates among males or possibly more severe health consequences of smoking for males, leading to higher premature mortality rates in comparison to females.

This loss in human capital wealth due to smoking is a significant public health concern and has implications for policy-making, including the need for effective smoking cessation programs and policies aimed at reducing the prevalence of smoking. Government can implement public health campaigns to raise awareness about the economic and social loss of smoking. Imposing higher taxes to tobacco products while allocating this resource to boosting human capital would allow Türkiye to build necessary human capital stock for inclusive and sustained development. Moreover, by promoting healthy lifestyles and preventive measures, Turkish government can reduce the incidence of illnesses that impact workforce productivity. By addressing the smoking issue, Türkiye could potentially improve its human capital wealth and economic productivity. This translates into an improvement in the potential economic output and growth of the country.

The goal of this chapter is to show the loss of human capital associated with health risk factors by estimating monetary value it. The analysis in this chapter focuses on the direct impact of smoking on the human capital loss in Türkiye. Same methodology can be applied to other risk factors to human health, such as high systolic blood pressure, air pollution, and diabetes.

Future research could focus on the potential increases in productivity that might result from a reduction in smoking and its subsequent effects on human capital. Moreover, a more detailed analysis could benefit from data on how long individuals smoked before their deaths, as the timing and severity of smoking-related deaths can vary based on smoking behavior and its health consequences.

CONCLUSION

"Here lies one who meant well, tried a little, failed much: -surely that may be his epitaph, of which he need not be ashamed."

Robert Louis Stevenson (1900), A Christmas Sermon

"The creation of skills in people will respond to incentives to invest in the future. No country has become rich with a universally unskilled population. Enrollment in formal schooling may be a poor measure of creation of skills."

William Easterly (2002), The Elusive Quest for Growth

Even though human capital was ignored in the economic theory until the second half of the 20th century, human capital has rapidly become one of the central elements of economic theory. Today, human capital is considered the core element of economic growth.

Representing about two-thirds of global wealth, human capital wealth is the largest component. This underscores the importance of investing in people—through education, health, and other means—to foster economic development and improve overall well-being. The value of human capital is recognized for its potential to generate economic returns and drive sustainable growth, making it a critical area of focus for policymakers and governments worldwide.

As William Easterly pointed out in his famous book that *"(...) no country has become rich with a universally unskilled population."* The creation of skills within a population is a critical factor in a country's economic growth and prosperity. While enrollment in formal schooling is often used as an indicator of a country's commitment to education, it may not always accurately reflect the actual skills and competencies being developed. Quality of education, relevance of the curriculum to the job market, access to vocational training, and lifelong learning opportunities are also important factors in skill creation. Countries that have successfully developed a skilled workforce have typically invested in comprehensive education systems that include not only formal schooling but also practical and vocational training, as well as policies that encourage innovation and continuous learning. This holistic approach to education and skill development is essential for preparing a population for the demands of a modern, knowledge-based economy.

Throughout this Ph. D. dissertation thesis, I've touched on important aspects of human capital wealth by focusing on the Turkish case. This thesis touched on three interlinked components of human capital after identifying the definition of human capital and how human capital theory evolved since the early economic thinking. First, our journey started with estimating the impact of the 1997 education reform on labor market earnings in Türkiye. Quality education provides people with the skills and knowledge they need to access opportunities and participate fully in society. By investing in education, countries can equip their populations with the tools necessary to innovate, adapt to new technologies and challenges, and contribute to economic growth. This, in turn, can help lift communities out of poverty and set them on a path to prosperity. However, it's important that these investments are well-targeted and inclusive, ensuring that all individuals, regardless of their background, have the opportunity to benefit from quality education. Therefore, at the heart of sustainable and inclusive development is education reform that boosts educational quality and schooling.

The policy changes in 1997 to extend mandatory schooling to eight years, and the 2012 education reform to make secondary education compulsory were extensive in improving educational attainment in the country. The analysis in Chapter 1 shows that the cohort born after 1986, who were subject to the 1997 reform, experienced higher returns to

education. This is evidenced by higher wages when compared to individuals born before 1986 who have the same level of education and experience. Such policy changes can have a long-term impact on the workforce and the economy by potentially increasing the skill level of the labor force and enhancing productivity. However, the empirical analysis conducted in Chapter 1 focuses on schooling's impact on labor market wages. The changing quality of education during the last 30 years is not tested. The impact could have been greater or smaller depending on education quality.

Türkiye has made considerable progress in increasing access to education, particularly in primary education. The expansion of the primary education system has led to close to universal participation in primary education, with a significant increase in enrollment rates. Despite improvements in access, the quality of education remains a concern. The literature highlights challenges in the quality of student learning, particularly in the initial years of education, and emphasizes the need to improve the quality of education to ensure better learning outcomes in later years (World Bank 2011b; World Bank 2013a). Furthermore, schooling without learning is a dreadful misuse of human capital potential. According to internationally comparable learning assessments, the skills of many middle-income countries fall significantly short of the levels to which those countries aspire. For instance, according to a 2019 UN report, Türkiye's education system faces barriers to quality inclusive education, including high student-teacher ratios, low quality of teaching in some areas, and weak assessment system (UNICEF 2019). According to the OECD, the gap among schools in wealthy neighborhoods and other regions is quite huge in Türkiye considering OECD countries. For instance, schools in poorer regions lack of necessary equipment, facilities, and resources compared to richer regions (Kitchen et al. 2019). Another OECD report highlights the poor performance of Turkish students in Programme for International Student Assessment (PISA) tests stating that a limited portion of students meet proficiency in all three core PISA disciplines (OECD 2020).

There is a growing need for increased investment in education in Türkiye, particularly in early childhood education and secondary education, to improve the school-to-work transition and reduce NEET (Not in Education, Employment, or Training) rates. The relationship between expenditure and learning outcomes is complex, and factors beyond

the level of spending on secondary school play a critical role in maximizing the returns to investment (World Bank 2013b; World Bank 2022; World Bank 2023b).

Despite the global increase in access to education and schooling, a significant portion of global youth population are graduating from school unequipped with basic skills. The human capital loss due to a learning crisis can have profound implications for development. When education systems fail to provide quality learning opportunities, individuals may lack the skills necessary for productive employment, which can lead to a cycle of poverty and underdevelopment. Moreover, a society may suffer from a lack of innovation and economic stagnation, as a well-educated workforce is often a key driver of growth. Therefore, addressing the learning crisis in Türkiye is essential to ensure that youth population can fulfill their potential and contribute to the prosperity of their communities.

The next stop in the human capital journey is calculating the monetary value of human capital wealth. Accounting for about two-thirds of global wealth, human capital constitutes the lion's share in global wealth. Considering her relatively young population Türkiye's population structure is promising. However, policies should not discourage labor force. Therefore, policies should be designed tailor-made to Türkiye's needs without distorting labor market outcomes and distribution. To do that, measuring the human capital wealth stock is key. By implementing the well-worn lifetime income methodology, I calculated Türkiye's human capital wealth. The findings shed light on a stagnation in Türkiye's human capital wealth. Moreover, stagnation in Türkiye's human capital wealth was quite common over the 2004-2020 period, particularly since 2016. Dishearteningly, per capita human capital wealth in Türkiye is less than the average of lower-middle-income countries. Furthermore, per capita human capital wealth in Türkiye is less than half of the European and Central Asia (low and middle-income countries) region average.

To improve Türkiye's human capital wealth, key policy issues should focus on enhancing access to quality education, promoting health and well-being, and ensuring inclusive economic opportunities. First and foremost, Türkiye should prioritize policies that enhance access to quality education for all, including marginalized groups such as

women, children, persons with disabilities, and minorities. This can involve investments in infrastructure, teacher training, and curriculum development to ensure equitable access to education services. Additionally, promoting investments in education that prioritize protecting people from falling into poverty due to illness and promoting human capital development can contribute to greater control by women and girls over their own reproductive and other health rights. Furthermore, Türkiye should focus on creating more and better jobs, addressing gaps in skills and knowledge to attain better jobs, and increasing asset ownership and control, particularly for women. This can involve providing credit coupled with skills training for women to acquire assets and processing units, as well as supporting policy and legal frameworks to improve women's access to credit. By addressing these key policy issues, Türkiye could make significant strides in improving her human capital wealth and fostering sustainable and inclusive development.

The final stop in the human capital journey is health aspect of human capital. Monetizing the loss of human capital associated with health risk factors allows policymakers to well-align policy priorities and efficiently use of limited public resources. Education is the core element of human capital, but health is also equally important for building human capital. Better health not only contributes to education by improving productivity and capable of learning but also extends the working life of individuals, allowing them to contribute to the economy for a longer period. Therefore, better health is a fundamental component of economic development, contributing to a more productive workforce, lower healthcare costs, and a stable social environment conducive to investment and growth.

The estimates indicate that premature deaths due to smoking lowers Türkiye's human capital. The loss of Türkiye's human capital due to premature deaths attributable to smoking was about 0.8 percent in 2020. This is quite important considering the global financing need of about 4 percent of global GDP per year to meet Sustainable Development Goals by 2030. Eliminating the loss attributable to health risks countries can create fiscal space for economic and social infrastructures, so does Türkiye. This study focuses on solely smoking's impact on human capital wealth, but it emphasizes

the importance of reducing losses associated with health risks. So, ignorance costs more than investing in health.

One of the efficient ways to create growth miracles in Türkiye is to take action on tackling structural problems that have become the backbone of sustained and inclusive development. In essence, human capital is a cornerstone of economic growth, and its development can lead to remarkable economic transformations, often referred to as economic growth miracles.

Economic growth miracles, such as those seen in the East Asian Tigers in the late 20th century, have been partly attributed to significant investments in human capital. Those countries prioritized education and skill development, which enabled them to rapidly transition from agriculture-based economies to industrial and service-oriented economies, leading to sustained high growth rates. Unfortunately, progress of human capital in Türkiye has not been promising. Policymakers need to focus on the gaps in human capital. Ignoring the quality aspect of education, increasing number of buildings and number of educational institutions don't help a country to overcome development bottlenecks. A holistic approach is needed, and policymakers needs to be aware of the needs of workforce and youth population to channel limited sources to well-targeted areas. In addition, understanding the gaps in human capital development will allow policymakers to design policies tailor-made to Türkiye's desperate needs. Otherwise, we will continue muttering massive upsets even if the global economy is favorable.

Last but not least, this PhD dissertation thesis contributes to the theoretical framework of human capital wealth by improving the lifetime income approach. To my knowledge, this is first academic paper that proposes a monetary measure to estimate the value of human capital. The empirical evidence generated from Türkiye's data can inform policy decisions, helping to craft strategies that promote equitable access to education and training opportunities, thereby fostering a more skilled and adaptable workforce. In essence, the scholarly work embodied in this dissertation thesis not only advances academic discourse but also has the potential to influence real-world outcomes by equipping decision-makers with the knowledge to enact effective human capital policies. In addition, this PhD dissertation thesis is the first attempt to estimate the

monetary value of human capital loss due to one of the health factors. The suggested approach can be applied to other health factors to help policymakers to understand the impact of critical health policies. Therefore, this PhD dissertation thesis can shed light on the mechanisms through which human capital contributes to economic growth and development.

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APPENDIX 1. ETHICS COMMISSION FORM

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

Date: 06/06/2024

ThesisTitle (In English): Essays on Human Capital

My thesis work with the title given above:

1. Does not perform experimentation on people or animals.
2. Does not necessitate the use of biological material (blood, urine, biological fluids and samples, etc.).
3. Does not involve any interference of the body's integrity.
4. Is not a research conducted with qualitative or quantitative approaches that require data collection from the participants by using techniques such as survey, scale (test), interview, focus group work, observation, experiment, interview.
5. Requires the use of data (books, documents, etc.) obtained from other people and institutions. However, this use will be carried out in accordance with the Personal Information Protection Law to the extent permitted by other persons and institutions.

I hereby declare that I reviewed the Directives of Ethics Boards of Hacettepe University and in regard to these directives it is not necessary to obtain permission from any Ethics Board in order to carry out my thesis study; I accept all legal responsibilities that may arise in any infrigement of the directives and that the information I have given above is correct.

I respectfully submit this for approval.

Kenan Karakülah

Student Information	Name-Surname	Kenan Karakülah		
	Student Number	N19143307		
	Department	Economics		
	Programme	Economics		
	Status	PhD	☒	Combined MA/MSc-PhD ☐

SUPERVISOR'S APPROVAL

Prof. Dr. Derya Güler Aydın

APPROVED
(Title, Name Surname, Signature)

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI BAŞKANLIĞINA

Tarih: 06/06/2024

Tez Başlığı: Beşeri Sermaye Üzerine Makaleler
....
Tez Başlığı (Almanca/Fransızca)*::...
....

Yukarıda başlığı verilen tez çalışmam:
1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır.
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
3. Beden bütünlüğüne veya ruh sağlığına müdahale içermemektedir.
4. Anket, ölçek (test), mülakat, odak grup çalışması, gözlem, deney, görüşme gibi teknikler kullanılarak katılımcılardan veri toplanmasını gerektiren nitel ya da nicel yaklaşımlarla yürütülen araştırma niteliğinde değildir.
5. Diğer kişi ve kurumlardan temin edilen veri kullanımını (kitap, belge vs.) gerektirmektedir. Ancak bu kullanım, diğer kişi ve kurumların izin verdiği ölçüde Kişisel Bilgilerin Korunması Kanuna riayet edilerek gerçekleştirilecektir.

Hacettepe Üniversitesi Etik Kurullarının Yönergelerini inceledim ve bunlara göre çalışmamın yürütülebilmesi için herhangi bir Etik Kuruldan izin alınmasına gerek olmadığını; aksi durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

Kenan Karakülah

Öğrenci Bilgileri	Ad-Soyad	Kenan Karakülah		
	Öğrenci No	N19143307		
	Enstitü Anabilim Dalı	İktisat		
	Programı	İktisat		
	Statüsü	Doktora	☒	Lisans Derecesi ile (Bütünleşik) Dr ☐

DANIŞMAN ONAYI

Prof. Dr. Derya Güler Aydın

UYGUNDUR.
(Unvan, Ad Soyad, İmza)

APPENDIX 2. ORIGINALITY REPORT

**TO HACETTEPE UNIVERSITY
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DEPARTMENT OF ECONOMICS**

Date: 11/06/2024

Thesis Title (In English): Essays on Human Capital

According to the originality report obtained by myself/my thesis advisor by using the Turnitin plagiarism detection software and by applying the filtering options checked below on 10/06/2024 for the total of 61 pages including the a) Title Page, b) Introduction, c) Main Chapters, and d) Conclusion sections of my thesis entitled above, the similarity index of my thesis is 22 %.

Filtering options applied**:

1. ☒ Approval and Decleration sections excluded
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I hereby declare that I have carefully read Hacettepe University Graduate School of Social Sciences Guidelines for Obtaining and Using Thesis Originality Reports that according to the maximum similarity index values specified in the Guidelines, my thesis does not include any form of plagiarism; that in any future detection of possible infringement of the regulations I accept all legal responsibility; and that all the information I have provided is correct to the best of my knowledge.

I respectfully submit this for approval.

Kenan Karakülah

Student Information	Name-Surname	Kenan Karakülah			
	Student Number	N19143307			
	Department	Economics			
	Programme	Economics			
	Status	PhD	☒	Combined MA/MSc-PhD	☐

SUPERVISOR'S APPROVAL

Prof. Dr. Derya Güler Aydın

APPROVED
(Title, Name and Surname, Signature)

**As mentioned in the second part [article (4)/3]of the Thesis Dissertation Originality Report's Codes of Practice of Hacettepe University Graduate School of Social Sciences, filtering should be done as following: excluding refence, quotation excluded/included, Match size up to 5 words excluded.

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI BAŞKANLIĞINA

Tarih: 11/06/2024

Tez Başlığı : Beşeri Sermaye Üzerine Makaleler

....

Tez Başlığı (Almanca/Fransızca)*::...

Yukarıda başlığı verilen tezimin a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 61 sayfalık kısmına ilişkin, 10/06/2024 tarihinde tez danışmanım tarafından Turnitin adlı intihal tespit programından aşağıda işaretlenmiş filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezimin benzerlik oranı % 22'dir.

Uygulanan filtrelemeler**:

1. ☒ Kabul/Onay ve Bildirim sayfaları hariç
2. ☒ Kaynakça hariç
3. ☐ Alıntılar hariç
4. ☒ Alıntılar dâhil
5. ☒ 5 kelimeden daha az örtüşme içeren metin kısımları hariç

Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Çalışması Orijinallik Raporu Alınması ve Kullanılması Uygulama Esasları'nı inceledim ve bu Uygulama Esasları'nda belirtilen azami benzerlik oranlarına göre tezimin herhangi bir intihal içermediğini; aksinin tespit edileceği muhtemel durumlarda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

Kenan Karakülah

Öğrenci Bilgileri	Ad-Soyad	Kenan Karakülah			
	Öğrenci No	N19143307			
	Enstitü Anabilim Dalı	İktisat			
	Programı	İktisat			
	Statüsü	Doktora	☒	Lisans Derecesi ile (Bütünleşik) Dr	☐

DANIŞMAN ONAYI

Prof. Dr. Derya Güler Aydın

UYGUNDUR.
(Unvan, Ad Soyad, İmza)

*Tez **Almanca** veya **Fransızca** yazılıyor ise bu kısımda tez başlığı **Tez Yazım Dilinde** yazılmalıdır.
**Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Çalışması Orjinallik Raporu Alınması ve Kullanılması Uygulama Esasları İkinci bölüm madde (4)/3'te de belirtildiği üzere: Kaynakça hariç, Alıntılar hariç/dahil, 5 kelimeden daha az örtüşme içeren metin kısımları hariç (Limit match size to 5 words) filtreleme yapılmalıdır.