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Research Article/Araştırma Makalesi

Impact of Education on Labor Market Wages in Türkiye[1]

Türkiye'de Eğitiminin Ücretler Üzerindeki Etkisi

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Abstract

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. This paper focuses on the impact of 1997 education reform on individual's earnings. As the paper suggests, 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 1986 with the same level of education and experience. In addition, the impact is greater in females compared to males.

Jel Codes: *I21, I28, I26, I20, I30*

Keywords: *Human Capital, Wages, Labor Market, Education, Schooling, Education Reform*

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Öz

Türkiye'nin milli eğitim sistemi son 30 yılda önemli değişikliklere uğramıştır. 1997'de zorunlu eğitimin sekiz yıla çıkarılması ve 2012'de ortaöğretimin zorun hale getirilmesi, ülkede eğitim başarısını artırmayı amaçlayan önemli politika değişiklikleridir. Bu makale, 1997 eğitim reformunun bireylerinin kazancı üzerindeki etkisine odaklanmaktadır. Makalede belirtildiği üzere, 1997 eğitim reformundan yararlanan 1986'dan sonra doğan grup, aynı eğitim ve deneyim düzeyine sahip 1986'dan önce doğanlarla karşılaştırıldığında, kazançlarına da yansıyan daha yüksek eğitim getirisi elde etmiştir. Ayrıca, söz konusu etki kadınlarda erkeklere göre daha yüksek olarak hesaplanmıştır.

Jel Kodları: *I21, I28, I26, I20, I30*
Anahtar Kelimeler: *Beşeri Sermaye, Ücretler, İşgücü Piyasası, Eğitim, Okullaşma, Eğitim Reformu*

1. Introduction

"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 is an essential piece of a country's economic and social development. It encompasses the knowledge, skills, and experience that individuals accumulate over their 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 is the most crucial component 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 wealth accounts for 70 percent of wealth in high-income countries, it accounts for only 41 percent of wealth in low-income countries (Lange et al. 2018). In addition, differences in human capital account for a significant portion of economic growth and cross-country per capita income differences.

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 goals of ending extreme poverty and promoting shared prosperity.

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 Gross Domestic Product (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. 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.

This paper 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. My research question for this paper is how the 1997 education reform affected labor market wages (male and female separately) in Türkiye. Using microdata from the Household Labor Survey (HLS) from Turkstat, I estimate the effect of mandatory extended primary schooling on labor market wages in Türkiye since 2000 using the well-known Mincerian wage equation. The paper is structures as follows: The second section includes some background information on education reforms in Türkiye. The third to fifth sections discuss the related literature, data and methodology, and results, respectively. Finally, I touch on some policy implications in the sixth section of this paper.

2. Education Reforms in Türkiye

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 paper, I include only education reforms on mandatory years of schooling in this paper.

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.

3. Related Literature

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).

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).

4. Data and Methodology

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	2,795.40	2,006.00	2,600.33	1,870.84	2,883.38	2,058.10

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:

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

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 paper. 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 paper 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 the paper. Therefore, the first-stage specification is as follows:

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

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:

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

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:

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

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.

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).

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 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

Notes: 1-Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

2-Model 1 is the OLS estimate for the control group, who were born before 1986, while Model 2 is the OLS estimate for the treatment group, who were born after 1986. Model 3 uses two-stages least squares with the 1997 reform as the instrumental variable. The education coefficient in Model 3 can be interpreted as the local average treatment effect.

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

Notes: 1-Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

2-Model 4 is the OLS estimate for the control group, who were born before 1986, while Model 5 is the OLS estimate for the treatment group, who were born after 1986. Model 6 is the two-stage least 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.

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 points out in his famous book *'The Elusive Quest for Growth'*, *"(…) no country has become rich with a universally unskilled population"* (Easterly 2002). 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.

In addition, education serves as a fundamental pillar in the attainment of virtually all other developmental goals. 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).

Education is a powerful driver of development and one of the strongest instruments for reducing poverty and improving health, gender equality, peace, and stability. 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.

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. In addition, the

impact of the 1997 reform on female wages is substantially greater compared to males. These findings are in parallel to the finding in the literature (e.g., Torun 2015; Karatas 2018; Patrinos et al. 2019). Unfortunately, social cost of education in Türkiye related to females are in general higher than that related to males (Tansel 2002). Therefore, girls tend to be excluded from formal schooling. This hints a significant policy space for Türkiye: Promoting gender equity by improving women's education level will contribute positively to economic development. However, education policies are required to be carefully designed so that education needs to be matched by job creation in the economy given that skills mismatch is another stubborn policy problem in Türkiye.

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 2011; World Bank 2013a). In addition, 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, Türkiye has one of the largest gaps between rich and poor schools in terms of access to material and human resources among OECD countries. For instance, schools in wealthier areas have access to additional resources that are not available to those in less advantaged communities (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).

Unfortunately, the analysis presented in this paper only reveals the impact of schooling. This paper 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. Fine-tuning the right balance between education quality and schooling will boost the country's human capital and thus, its development.

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 doesn'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.

Finally, the potential further research could incorporate the quality aspect of education. In addition, disaggregating the impacts of schooling and quality of education could be a very useful research issue. Moreover, the cohort impacted from the 2012 education reform has just started to join the workforce. The impact of the 2012 education reform will be more observable once more youth joins the workforce. Therefore, repeating the analysis suggested in this paper within a few years would be useful to understand the impact of education reforms in Türkiye.

References

Acemoglu, D. and J. Angrist (2000). How Large Are Human-Capital Externalities? Evidence from Compulsory Schooling Laws. B. S. Bernanke and K. Rogoff (Eds.), *Macroeconomics Annual*. Cambridge, Massachusetts: NBER.

Botev, J., Égert, B., Smidova, Z. and Turner, D. (2019). *A New Macroeconomic Measure of Human Capital with Strong Empirical Links to Productivity*. OECD Economics Department Working Papers, No. 1575, OECD Publishing, Paris.

Card, D. (1994). *Earnings, Schooling, and Ability Revisited*. Working Paper no. 4832, National Bureau of Economic Research, Cambridge, MA.

Card, D. (1999). The Causal Effect of Education on Earnings. O. Ashenfelter and D. Card (Eds), *Handbook of Labor Economics*, Vol. 3A, Elsevier.

Card, D. (2001). Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems. *Econometrica, 69*(5), 1127-1160.

Dursun, B. and Cesur, R. (2016). Transforming Lives: The Impact of Compulsory Schooling on Hope and Happiness. *Journal of Population Economics, 2016*(29), 911-956.

Easterly, William, (2002), The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics, MIT Press Books, The MIT Press, edition 1, volume 1, number 0262550423, December.

Feenstra, R. C., Inklaar, R. and Timmer, M. P. (2015). The Next Generation of the Penn World Table. *American Economic Review, 105*(10), 3150-3182.

Grenet, J. (2013). Is Extending Compulsory Schooling Alone Enough to Raise Earnings? Evidence from French and British Compulsory Schooling Laws. *Scandinavian Journal of Economics, 115*(1), 176-210.

Hanushek, E. A. and Woessmann, L. (2007). *The Role of School Improvement in Economic Development*.

Hanushek, E. A. and Kimko, D. D. (2000). Schooling, Labor-Force Quality, and the Growth of Nations. *American Economic Review, 90*(5), 1184-1208.

Harmon, C. and Walker, I. (1995). Estimates of the Economic Return to Schooling for the United Kingdom. *American Economic Review, 85*, 1278-1286.

Heckman, J. and Cameron, S. V. (2001). The Dynamics of Educational Attainment for Black, Hispanic, and White Males. *Journal of Political Economy*.

Imbens, G. W. and Angrist, J. D. (1994). Identification and Estimation of Local Average Treatment Effects. *Econometrica, 62*(2), 467-475.

Jorgenson, D. W. and Fraumeni, B. M. (1989). The Accumulation of Human and Non-Human Capital, 1948-1984. R. E. Lipsey and H. S. Tice (Eds.), *The Measurement of Savings, Investment, and Wealth*. The University of Chicago Press, Chicago.

Jorgenson, D. W and Fraumeni, B. M. (1992a). The Output of Education Sector. Z. Griliches (Ed.), *Output Measurement in the Service Sectors*. The University of Chicago Press, Chicago.

Jorgenson, D. W and Fraumeni, B. M. (1992b). Investment in Education and U.S. Economic Growth. *Scandinavian Journal of Economics, 94*, 51-70.

Karatas, H. M. (2018). The Returns to Formal Schooling in Turkey Using Pseudo-Panel Data. *Giresun Üniversitesi İktisadi ve İdari Bilimler Dergisi, 4*(8), 13-33.

Kitchen, Hannah, G. Bethell, E. Fordham, K. Henderson, and R. R. Li. 2019. OECD Reviews of Evaluation and Assessment in Education: Student Assessment in Turkey, OECD Reviews of Evaluation and Assessment in Education, OECD Publishing, Paris.

Lang, K. (1993). *Ability Bias, Discount Rate Bias and the Return to Education*. MPRA Paper, University Library of Munich, Germany.

Lange, G. M., Wodon, Q. and Carey, K. (2018). *The Changing Wealth of Nations 2018: Building a Sustainable Future*. Washington, DC: World Bank.

Lindquist, C. (2017). Educational Reform in Turkey. *International Journal of Progressive Education, 13*(2), 133-142.

MacDonald, G. M. (1981). The Impact of Schooling on Wages. *Econometrica, 49*(5), 1349-359.

Mincer, J. (1974). *Schooling, Experience, and Earnings*. New York: NBER Press.

Mocan, L. (2014). *The Impact of Education on Wages: Analysis of an Education Reform in Turkey*. Koç University-TUSIAD Economic Research Forum Working Papers 1424, Koc University-TUSIAD Economic Research Forum.

OECD, (2006). The Returns to Education: Links between Education, Economic Growth and Social Outcomes, in Education at a Glance 2006: OECD Indicators, OECD Publishing, Paris.

OECD (2020), Education Policy Outlook: Turkey, OECD Publishing, Paris.

Oreopoulos P. (2006). Estimating Average and Local Average Treatment Effects of Education When Compulsory Schooling Laws Really Matter. *American Economic Review, 96*, 152-175.

Patrinos, H. A. and Psacharopoulos, G. (2010). Returns to Education in Developing Countries. D. J. Brewer and P. J. McEwan (Eds.), *Economics of Education* (44-51). Elsevier, San Diego.

Montenegro, C. E. and Patrinos, H. A. (2014). *Comparable Estimates of Returns to Schooling Around the World*. World Bank Policy Research Working Paper No. 7020.

Patrinos, H. A., Psacharopoulos, G. and Tansel, A. (2019). *Returns to Investment in Education: The Case of Turkey*. Munich Personal RePEc Archive.

Psacharopoulos, G. (1981). Returns to Education: An Updated International Comparison. *Comparative Education, 17*(3), 321-341.

Psacharopoulos, G. (1985). Returns to Education: A Further International Update and Implications. *Journal of Human Resources, 20*(4), 583-604.

Psacharopoulos, G. (1995). *The Profitability of Investment in Education: Concepts and Methods*. World Bank, Human Capital Development and Operations Policy, Working Papers No. 63.

Psacharopoulos, G. and Mattson, R. (1998). Estimating the Returns to Education: A Sensitivity Analysis of Methods and Sample Size. *Journal of Educational Development and Administration, 12*(3), 271-287.

Psacharopoulos, G. and Patrinos, H. A. (2004). Returns to Investment in Education: A Further Update. *Education Economics, 12*(2), 111-135.

Perkins, D. H., Radelet, S., Lindauer, D. L. and Block, S. A. (2013). *Economics of Development*. W. W. Norton and Company.

Tansel, Aysit. (2002). Determinants of School Attainment of Boys and Girls in Turkey: Individual, Household, and Community Factors. Economics of Education Review, 21, No. 5:455-470

Tansel, Aysit. (2015). Intergenerational Educational Mobility in Turkey. IZA Discussion Paper No. 9590. Institute of Labor Economics.

Timmer, M. (2012). *The World Input-Output Database (WIOD): Contents, Sources and Methods*. WIOD Working Paper Number 10.

Torun, H. (2015). *Compulsory Schooling and Early Labor Market Outcomes in a Middle-Income Country*. Working Paper No: 15/34, Central Bank of the Republic of Turkey.

UNICEF, (2019), Turkey Education Sectoral and OR+ (Thematic) Report.

Wealth Accounting, The World Bank. https://datacatalog.worldbank.org/dataset/wealth-accounting.

World Bank, (2011), Improving the Quality and Equity of Basic Education in Turkey : Challenges and Options. Vol. 1 of 2. Washington, DC: World Bank.

World Bank, (2013a), Promoting excellence in Turkey's schools. Washington, DC: World Bank.

World Bank, (2013b), Expanding and Improving Early Childhood Education in Turkey. Washington, DC: World Bank.

World Bank, (2019), The Human Capital Project: Frequently Asked Questions, March 19, 2019. accessed through https://www.worldbank.org/en/publication/human-capital/brief/the-human-capital-project-frequently-asked-questions.

World Bank, (2022), Türkiye in Transition - Next-Generation Human Capital Investments for Inclusive Jobs : Policy Note. Washington, DC: World Bank.

World Bank, (2023a), Realizing Education's Promise: A World Bank Retrospective. Washington, DC: World Bank.

World Bank, (2023b), Türkiye Public Finance Review : Leveraging Fiscal Resources for Stability and Resilience. Washington, DC: World Bank.

World Economic Forum. (2016). The Global Competitiveness Report 2016-2017. (K. Schwab, Ed.) Geneva, Switzerland: World Economic Forum.

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

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