

Araştırma Makalesi / Research ArticleQuality Growth and Okun's Law in Türkiye¹*Türkiye'de Kaliteli Büyüme ve Okun Yasası*Mücahit ÜLGER²  & Mert TOPCU³ DOI : [10.63556/ankad.v10i3.427](https://doi.org/10.63556/ankad.v10i3.427)

Geliş/Received: 19/01/2026

Kabul/Accepted: 13/05/2026

Abstract

This study investigates the validity of Okun's Law in Türkiye over the period 1990-2019. Significant economic, political, and social transformations experienced over the reference period in the country have caused considerable changes in the growth structure. Therefore, the Okun coefficient may not be accurate, and policies for reducing unemployment developed in this context might not be inclusive in case the estimation of the Okun coefficient solely depends on quantitative income growth. Stemming from this viewpoint, the main motivation of the study is to revise the analysis of Okun's Law in Türkiye using a quality growth index that can capture the layers of economic growth from a broader perspective. In this context, the Quality Growth Index proposed by Mlachila et al. (2017) has been calculated for Türkiye and used as a substitute for GDP growth in estimating the Okun coefficient. Empirical findings indicate that the negative effect obtained from quality growth on unemployment is greater than the negative effect of quantitative growth in magnitude. We also find that this finding is robust to different model specifications. Moreover, policy implications pertaining to the empirical results are also discussed.

Anahtar Kelimeler: Okun's Law, Quality Growth, Economic Growth, Unemployment, Türkiye.

Öz

Bu çalışma, 1990-2019 döneminde Türkiye'de Okun Yasası'nın geçerliliğini incelemektedir. Referans dönemde ülkede yaşanan önemli ekonomik, siyasi ve sosyal dönüşümler; büyüme yapısında önemli değişikliklere neden olmuştur. Bu nedenle, Okun katsayısı doğru olmayabilir ve Okun katsayısının tahmini yalnızca niceliksel gelir artışına bağlıysa, bu bağlamda geliştirilen işsizliği azaltma politikaları kapsayıcı olmayabilir. Bu bakış açısından hareketle, çalışmanın temel amacı, ekonomik büyümenin katmanlarını daha geniş bir perspektiften ele alabilen bir kaliteli büyüme endeksi kullanarak Türkiye'de Okun Yasası'nın analizini revize etmektir. Bu bağlamda, Mlachila vd. (2017) tarafından önerilen Kaliteli Büyüme Endeksi Türkiye için hesaplanmış ve Okun katsayısının tahmininde GSYH büyümesinin yerine kullanılmıştır. Ampirik bulgular, kaliteli büyümenin işsizlik üzerindeki olumsuz etkisinin, niceliksel büyümenin olumsuz etkisinden daha büyük olduğunu göstermektedir. Bu bulgunun farklı model özelliklerine karşı da sağlam olduğu tespit edilmiştir. Ayrıca, ampirik sonuçlarla ilgili politika çıkarımları da tartışılmıştır.

Keywords: Okun Yasası, Kaliteli Büyüme, Ekonomik Büyüme, İşsizlik, Türkiye.

¹This study is derived from the PhD dissertation prepared by Mücahit Ülger under the supervision of Mert Topcu.

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Önerilen Atıf/Suggestion Citation

Ülger, M. & Topcu, M. (2026). Quality Growth and Okun's Law in Türkiye. *Anadolu Kültürel Araştırmalar Dergisi*, 10(3), 1404-1428.

1. INTRODUCTION

The interaction between unemployment and economic growth has been a central focus in the economics and policy literature for more than half a century. At the core of this debate lies Okun's Law, first introduced by Arthur Okun in 1962. This law posits that as an economy expands, the unemployment rate should decline in a proportionate manner, thereby highlighting the intrinsic link between achieving economic growth and the societal imperative of job creation.

Although this law has been extensively examined in the context of advanced economies, it presents an even more compelling field of inquiry for developing countries, given their dynamic growth trajectories, large labor force potential, and heterogeneous socio-economic structures. In contrast to developed economies, these countries often face challenges such as informal labor markets, structural unemployment, and more pronounced growth fluctuations. Hence, the accurate and stable estimation of the Okun coefficient can capture these complex dynamics more effectively and provide valuable guidance for the design of appropriate economic policies in developing economies.

This study investigates the validity of Okun's Law in Türkiye over the period 1990–2019. In Türkiye, where unemployment largely stems from the limited capacity to generate new, long-term, and high-quality jobs, and where youth unemployment remains a pressing issue, significant economic, political, and social transformations since 1990 have also reshaped the structure of growth. Consequently, measuring the Okun coefficient solely through a quantitative increase in income may lead to misleading results, and unemployment policies designed on this basis risk lacking inclusiveness.

Following the literature demonstrating the positive impact of human capital on economic growth, subsequent theoretical debates have emphasized that growth often neglects the qualitative dimensions of sustainable welfare and social equity. These debates have reinforced the need for a growth paradigm that is strong, stable, sustainable, productivity-enhancing, and, above all, socially desirable in terms of improving living standards and reducing poverty. This paradigm shift has brought forward various growth indices that highlight the quality of growth.

Building on these considerations, the primary motivation of this study is to revise the analysis of Okun's Law in Türkiye by employing a quality of growth index that captures the multiple layers of economic growth from a broader perspective. To this end, for the period 1990–2019, the Quality of Growth Index proposed by Mlachila et al. (2017) for developing economies will be computed for Türkiye. Within this framework, the central hypothesis of the study is that “quality growth reduces unemployment to a greater extent than quantitative expansion measured by GDP growth”.

This study is expected to contribute to the existing literature in two respects. The first relates to its motivation: to the best of our knowledge, no prior study has revised Okun's Law through the use of a quality of growth index. Hence, this research constitutes the first attempt to estimate the Okun coefficient by explicitly incorporating the quality of growth. The second contribution concerns the computation of the quality of growth index. Unlike Mlachila et al. (2017), the present study does not assume equal weights for the subcomponents; instead, the relative weights of each component in quality growth are determined through Principal Component Analysis (PCA).

By the nature of social sciences, certain boundaries have been set in the scope of this research. The first pertains to the study's coverage. In testing the validity of Okun's Law, the first differences model, the dynamic model, and the asymmetric model are employed, while the trial gaps model, the fitted trend and elasticity model are excluded from the analysis. The second limitation relates to the time horizon, as the study focuses exclusively on the period 1990–2019.

2. THEORETICAL FRAMEWORK

2.1. Okun's Law

Okun (1962) concludes that every 1% increase in the unemployment rate above the natural level of 4% would lead to a 3% decline in output in the United States. The empirical findings from the United States and many other countries at that time also supported Okun's Law. However, subsequent studies have demonstrated that the exact magnitude of this negative correlation has varied over time and differs not only across countries but even across regions (Christopoulos, 2004; Freeman, 2000, 2001; Lee, 2000).

From both theoretical and empirical perspectives, Okun's Law proves to be highly significant. Theoretically, grounded in both old and new Keynesian frameworks, Okun's Law plays a crucial role in deriving the aggregate supply curve alongside the Phillips Curve. Empirically, the Okun coefficient has served as a fundamental rule of thumb, useful for policy design and forecasting (Harris and Silverstone, 2001; Huang and Yeh, 2013). Okun's Law has been utilized not only by economists but also by policymakers, who frequently employ it together with the Phillips Curve to better understand the outcomes of specific economic policy measures for labor and commodity markets (Knoester, 1986). Moreover, as a measure of the sensitivity of unemployment to output growth, the empirical results of the Okun coefficient provide valuable insights by quantifying the cost of unemployment (Lee, 2000; Moosa, 1997; Silvapulle et al., 2004).

Initially, Okun (1962) employed three different models in examining the relationship between economic growth and unemployment in the U.S. economy. Following Okun (1962), the empirical framework of this relationship has been further expanded by testing the theory through dynamic and asymmetric models.

2.2. Models in Okun's Law

2.2.1. First Differences Model

Okun's difference model reveals how changes in the unemployment rate statistically respond to changes in real output (Okun, 1962). The main reason the model is termed a difference model according to Okun's Law is that the differences between the variables are taken and used when statistically analysing the relationship between the unemployment rate and growth. Okun's Law's first difference model is as follows:

$$\Delta U_t = \alpha + \beta \Delta Y_t + \varepsilon_t \quad (1)$$

In Equation (1), the Δ parameter represents the change relative to the previous period; α is the constant term; ε_t is the error term; and β is Okun's coefficient. U_t denotes the unemployment rate in period t , while Y_t represents output growth. The β coefficient shows the effect of the change in real output on the change in unemployment. According to Okun's theory, the β parameter is expected to be negative ($\beta < 0$) (Akram et al., 2014). This negative relationship reveals the inverse relationship between the growth rate and the change in unemployment. Therefore, rapid output growth is associated with a decline in unemployment, while negative output growth is associated with an increase in unemployment (Knotek, 2007).

Okun (1962) estimated the following equation using the difference model for the US economy:

$$U_t = 0,30 - 0,30Y_t \quad (2)$$

According to Equation (2), Okun's coefficient has been determined as 0.30. The results of the equation show that a 1-unit increase in output will reduce unemployment by 0.30%. Furthermore, the fixed coefficient of 0.30 indicates that even if there is no change in output, unemployment will increase by 0.30 from one quarter to the next (Okun, 1962).

2.2.2. Dynamic Model

Following Okun (1962), the dynamic model developed subsequently demonstrated that both past and current output could influence the current level of unemployment. In the dynamic model, lagged values of economic growth and the unemployment rate were incorporated into the model as explanatory variables, thereby expanding the model. This model does not have a simple interpretation compared to the difference model and even the open model. However, the dynamic model shows partial similarity to the difference model because it extends Okun's Law's difference model with lagged values (Akram et al., 2014). The dynamic model of Okun's Law is as follows:

$$\Delta U_t = \alpha + \beta_0 \Delta Y_t + \beta_1 \Delta Y_{t-1} \dots + \beta_n \Delta Y_{t-n} + \delta_1 \Delta U_{t-1} + \dots + \delta_n \Delta U_{t-n} + \varepsilon_t \quad (3)$$

In Equation (3), the parameters ΔU_t and ΔY_t represent the current period unemployment rate growth and current period real output growth, respectively; the parameters ΔY_{t-1} and ΔU_{t-1} represent the first lag

of real output growth and the first lag of unemployment rate growth, respectively. The term ‘n’ denotes the number of lags.

2.2.3. Asymmetric Model

The asymmetric relationship in output-unemployment analysis represented by Okun's Law has been a subject of recent study. Here, asymmetry means that the response of unemployment to output growth when the economy expands differs from the response of unemployment to output growth when the economy contracts. The fact that these expansions and contractions in output have the same absolute effect on unemployment differs from the traditional case of symmetry (Silvapulle et al., 2004). If the Okun relationship has changed over time and varies across countries, it is important for policymakers to understand both the magnitude and direction of the changes and differences in the asymmetric relationship in Okun's Law (Beaton, 2010).

Some empirical studies have concluded that output may have different effects on unemployment during periods of economic expansion and contraction (Harris and Silverstone, 2001; Lee, 2000; Tang and Bethencourt, 2017). Upon examining these studies, it is clear that the relationship between unemployment and output is not linear. For this reason, it is understood that the unemployment-output relationship may be asymmetric rather than symmetric in both short-term and long-term conditions. In addition, unemployment generally responds more strongly during periods of stagnation than during periods of expansion (Crespo-Cuaresma, 2003; Huang and Chang, 2005).

Studies investigating the existence of asymmetric relationships in Okun's Law suggest certain circumstances that potentially cause this relationship. These circumstances are factor substitution, changes in labour force participation and sectoral growth rates, asymmetry between growing and shrinking firms, and time lags (Harris and Silverstone, 2001). Furthermore, studies examining asymmetry in Okun's relationship have addressed this asymmetry from two perspectives. First, an asymmetric relationship occurs when equal absolute increases and decreases in output lead to different responses in unemployment. Second, the response of the unemployment rate to output may differ depending on whether the economy is in an expansionary or contractionary phase (Holmes and Silverstone, 2006).

The asymmetric relationship described above is considered significant for several reasons. Firstly, it allows us to distinguish between alternative theories regarding common labour and goods market behaviour. Secondly, whether a country's Okun relationship is asymmetric or symmetric will likely reinforce an asymmetric Phillips Curve situation. Another reason is that information about the extent of asymmetry in the output-unemployment relationship is useful for both structural and stability policies. Finally, ignoring asymmetry when it exists in Okun's Law can lead to estimation errors in research (Harris and Silverstone, 2001). The asymmetric model of Okun's Law is as follows:

$$\Delta U_t = \gamma_0 + \gamma_1 U_{t-1} + \gamma_2^+ Y_{t-1}^+ + \gamma_2^- Y_{t-1}^- + \sum_{i=1}^l \theta_i \Delta U_{t-i} + \sum_{i=0}^m \delta_i^+ \Delta Y_{t-i}^+ + \sum_{i=0}^m \delta_i^- \Delta Y_{t-i}^- + \varepsilon_t \quad (4)$$

The Δ in Equation (4) is the first difference operator; γ, θ and δ are the estimated parameters. In addition, γ_0 is the constant term; γ_1 and γ_2 are the long-term coefficients, while θ_i and δ_i represent the short-term coefficients. Here, l and m denote the optimal lag.

2.3. Quality Growth

Economic growth is an important macroeconomic indicator for all countries, regardless of their level of development (Zakariene, 2024). However, recent studies suggest that high growth alone does not necessarily lead to the desired social outcomes. What matters here is whether growth is inclusive. Accordingly, inclusiveness has come to be regarded as a key component of a successful growth strategy. Within this framework, the concept of quality growth has recently attracted growing attention (Mlachila et al., 2017).

To understand what quality growth entails, it is first necessary to clarify the notion of inclusive growth, since the two concepts are closely related but not identical. Inclusive growth mainly refers to the distributional and opportunity-related dimensions of economic growth. Inclusive growth mainly refers to the distributional and opportunity-related dimensions of economic growth. The term inclusive, dating

back to the early 21st century, was used by Kakwani and Pernia (2000) to emphasize the pro-poor nature of growth. The inclusiveness of growth is closely linked to equity, equality of opportunity, and protection during market and employment transitions (Commission on Growth, 2008). In defining inclusive growth, attention is drawn to both the pace and distribution of economic growth, with emphasis on its sustainability and its role in reducing poverty (Anand et al., 2013). Although there is still no universally agreed-upon definition of inclusive growth, existing descriptions consistently underline its poverty-reducing and opportunity-creating dimensions. Some of these definitions are as follows: Ianchovichina and Lundström (2009) define inclusive growth as rapid and sustainable poverty-reducing growth in which individuals both contribute to and benefit from economic expansion. Similarly, Habito (2009) characterizes inclusive growth as growth that leads to a significant reduction in poverty. Klasen (2010) considers inclusive growth to be growth that benefits all segments of society—including the poor, the near-poor middle-income groups, and even the wealthy. Ali and Zhuang (2007) emphasize the necessity of defining inclusive growth as growth with equal opportunities. Growth is regarded as inclusive when it enables all members of society, regardless of their individual circumstances, to participate in and contribute to the growth process on an equal footing. Along these lines, Ali and Son (2007) argue that inclusive growth is not only about creating new economic opportunities but also about ensuring equal access to these opportunities for all segments of society. According to the International Monetary Fund (International Monetary Fund, 2017), inclusive growth specifically refers to the distributive dimension of growth that helps foster equity, and is defined as the broad sharing of the benefits and opportunities generated by economic expansion.

While inclusive growth focuses primarily on whether the benefits and opportunities generated by growth are broadly shared across society, the concept of quality growth provides a broader analytical framework. Mlachila et al. (2017) propose the quality of growth as a multidimensional concept that evaluates not only the inclusiveness of growth but also its strength, stability, resilience, and social orientation. In this respect, quality growth should not be interpreted merely as a direct indicator of inclusive growth. Rather, it can be viewed as a wider framework within which inclusive growth constitutes one central dimension. Put differently, inclusive growth captures the distributional and opportunity-enhancing character of growth, whereas quality growth assesses whether growth is sufficiently strong, durable, and socially friendly to support these outcomes over time. Therefore, the Quality of Growth Index (QGI) is not simply a proxy for inclusive growth; it is a broader composite measure that incorporates the pro-poor and socially inclusive aspects of growth together with its macroeconomic strength and sustainability. This distinction is important for the present study because it allows the analysis to move beyond the question of whether growth reduces poverty or expands opportunities, and to examine whether the overall structure and quality of growth create the conditions under which inclusive outcomes can be sustained. While inclusive growth focuses primarily on whether the benefits and opportunities generated by growth are broadly shared across society, the concept of quality growth provides a broader analytical framework. Mlachila et al. (2017) propose the quality of growth as a multidimensional concept that evaluates not only the inclusiveness of growth but also its strength, stability, resilience, and social orientation. In this respect, quality growth should not be interpreted merely as a direct indicator of inclusive growth. Rather, it can be viewed as a wider framework within which inclusive growth constitutes one central dimension. Put differently, inclusive growth captures the distributional and opportunity-enhancing character of growth, whereas quality growth assesses whether growth is sufficiently strong, durable, and socially friendly to support these outcomes over time. Therefore, the QGI is not simply a proxy for inclusive growth; it is a broader composite measure that incorporates the pro-poor and socially inclusive aspects of growth together with its macroeconomic strength and sustainability. This distinction is important for the present study because it allows the analysis to move beyond the question of whether growth reduces poverty or expands opportunities, and to examine whether the overall structure and quality of growth create the conditions under which inclusive outcomes can be sustained.

It is essential to define quality growth on the basis of two key characteristics. The first is the need to evaluate growth in terms of its intrinsic features (strength, volatility, and sustainability). The second is the necessity of analyzing the impact of growth on various socio-economic outcomes. With these features, the concept of quality growth is defined as growth that is robust, stable, sustainable, productivity-enhancing, and socially desirable in terms of improving living standards, particularly by

reducing poverty. High growth quality is crucial for raising living standards and welfare, as well as for creating better employment opportunities. Accordingly, how growth is generated, its sustainability, its capacity to create employment, and its ability to accelerate poverty reduction are of particular importance for quality growth (Martinez & Mlachila, 2013).

The quality of growth framework developed by Lopez et al. (2008) and Thomas et al. (1999) emphasizes three core dimensions of growth: poverty reduction, equity, and environmental sustainability. In this sense, quality growth is understood as an economic growth process that reduces extreme poverty, narrows structural inequalities, preserves the environment, and sustains the growth trajectory (Lopez et al., 2008). In addition, achieving poverty reduction requires growth that is strong, stable, diversified, and export-oriented (Dollar & Kraay, 2002).

National economies must transform the strong growth they achieve into improved living conditions. Yet poverty, inequality, and unemployment indicators remain persistently high in many countries. The quality of growth is as important as its level. High growth alone will not improve social outcomes, just as favorable social outcomes cannot be sustained without robust growth. In developing economies, sound growth should promote the ultimate objectives of any development policy: improving living standards, reducing poverty, and lowering inequality (Mlachila et al., 2015).

3. MEASURING QUALITY GROWTH

The Quality Growth Index (QGI) constructed in this study essentially captures all dimensions of inclusive growth. To this end, a single index has been developed to represent inclusive growth. The index is based on two main components: the foundations of quality growth and its social dimension. The foundations of quality growth are derived from four variables—growth strength, growth stability, diversification of growth sources, and outward orientation of growth. The social dimension of quality growth is represented by education and health indicators. The indicators of the QGI are presented in Figure 1.

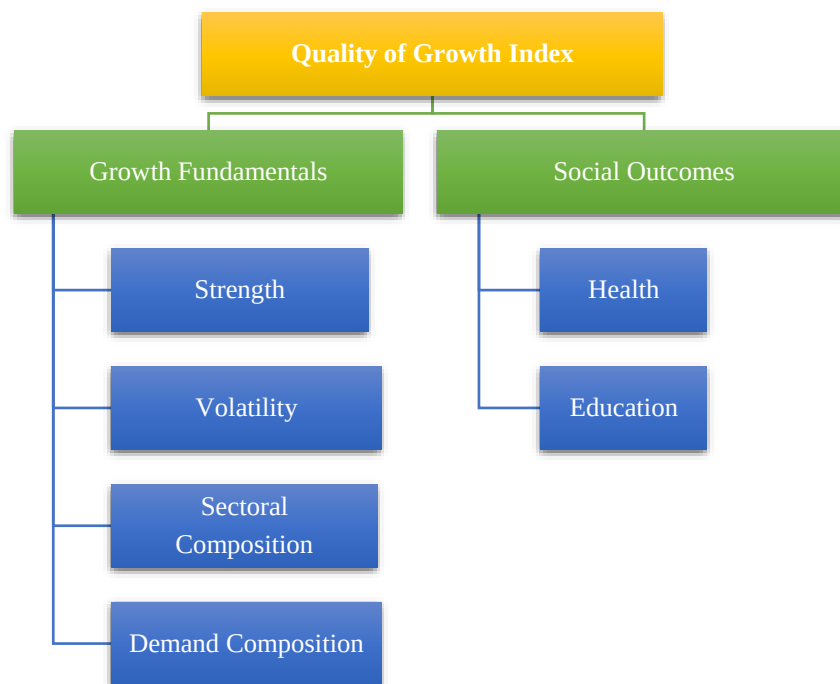


Figure 1. Conceptual Representation of the Quality Growth Index

Source: Mlachila et al. (2017)

3.1. Growth Fundamentals

i) Strength: This is an important variable of the Quality Growth Index, as high growth constitutes a necessary component for poverty reduction (Dollar & Kraay, 2002). Growth strength is measured by the annual change in real GDP per capita. A higher level of real GDP per capita leads to a significant

reduction in poverty and, consequently, to the formation of a stronger Quality Growth Index. The preference for GDP per capita over aggregate GDP lies in its closer alignment with the concept of pro-poor growth, which underpins the notion of quality growth (Mlachila et al., 2017).

ii) Volatility: Economic activity, measured by GDP, is taken as the basis for volatility. Growth stability is calculated as the inverse of the coefficient of variation (CV), which is defined as the ratio of the standard deviation to the mean. To obtain time-varying coefficients of variation, a 5-year rolling window is employed.

iii) Sectoral Composition: This indicator measures the extent to which national resources contribute to production. The variable is derived using the Herfindahl–Hirschman Index (HHI), one of the most widely used measures of industrial concentration (Brezina et al., 2016). A higher HHI value indicates greater industrial concentration and, therefore, a more unequal distribution of industries, whereas a lower HHI value reflects a more balanced industrial distribution (Lu et al., 2017). The diversification of growth sources is calculated as one minus the HHI (1–HHI).

iv) Demand Composition: An outward-oriented growth strategy is based on the premise that productivity growth is more likely to increase through various mechanisms such as learning processes, advanced technology imports, knowledge transfer, the global trading system, competition, and foreign direct investment (Diao et al., 2006). This variable is measured by the share of net external demand as a percentage of GDP. Outward-oriented policies, reflected in a real exchange rate that promotes exports, foster the development of tradable sectors. External orientation also enables the use of foreign capital for development without facing severe difficulties in debt repayment. Moreover, outward orientation often results in faster export growth. Thus, this concept can be explained by the externalities through which open economies experience more rapid growth over extended periods, driven by exports (Dollar, 1992).

Outward orientation is often defined as a combination of two factors. The first is a relatively low level of protection, particularly for inputs used in the production process. The second is relatively low variability in the real exchange rate, ensuring consistency of incentives over time. Dollar (1992) finds a statistically significant relationship between growth and outward orientation.

3.2. Social Outcomes

i) Health: This component demonstrates the extent to which a country's population can live a long and healthy life by combining two sub-variables. The health variable is calculated using the reverse of infant mortality rate (infant survival rate) together with life expectancy at birth. Health has increasingly been recognized as a key aspect of individual and national development and of economic well-being worldwide (Piabuo & Tieguhong, 2017). Moreover, health has been an important determinant of economic development. A healthier population leads to higher productivity, which in turn translates into higher per capita income (World Health Organization, 2005). Health is thus both a cause and a consequence of economic growth.

The infant mortality rate is defined as the proportion of infant deaths under the age of one per 1,000 live births in a given country. This health indicator is widely regarded as a strong measure of population health, reflecting both child health and maternal health (Rubio, 2011). Infant mortality is considered the single most comprehensive indicator of health in a society (Filmer & Pritchett, 1997). Life expectancy at birth, on the other hand, is defined as the average number of years a person is expected to live from the time of birth. It serves as an important synthetic indicator for assessing the economic and social development of a country or region (Bilas et al., 2014).

The outputs of health systems are typically measured through longevity indicators—such as life expectancy at birth, life expectancy at age 65, or healthy life expectancy—or through mortality indicators, including overall mortality rates, infant mortality rates, and years of life lost. These measures are widely regarded as reliable indicators for assessing the health status of a population (Or, 2000; Poças & Soukiazis, 2010).

ii) Education: The economic benefits of education are crucial for improving growth rates. A more educated society translates into higher rates of economic growth and, consequently, enhances governments' capacity to alleviate poverty (Cooray, 2009). Moreover, education plays a vital role in the

development of human capital, which is the key to scientific and technological progress. It also contributes to combating unemployment, thereby reinforcing the foundation of social equity, awareness, and cultural vitality. Education increases individual productivity and efficiency while generating qualified human capital that can be harnessed in the process of economic development (Mekdad et al., 2014).

Education is measured through indicators such as school enrollment rates (Barro, 1991), average years of schooling (Hanushek & Woessmann, 2008), adult literacy rates (Durlauf and Johnson, 1995), and education expenditures (Baldacci et al., 2008). Mlachila et al. (2017) suggest that average years of schooling and net primary enrollment can serve as reliable indicators of a country's education level. Appendix A summarizes how the variables used in constructing the QGI are measured and provides the corresponding data sources.

4. CONSTRUCTION OF THE QGI

4.1. Variable Standardization

Since the variables used in constructing the Quality Growth Index are measured on different scales, it is not possible to express them in the same unit. Standardization, or normalization, enables the data for each variable to be expressed within a common range. In this process, each variable is standardized such that its mean equals 0 and its standard deviation equals 1. In the Min–Max normalization technique, the maximum and minimum values of each variable in the dataset are taken as reference points. The series are then rescaled so that the highest value is assigned 1 and the lowest value 0, thereby completing the normalization process. In this study, the widely used Min–Max approach in the literature is employed to transform the variables into a single index. Under this approach, a variable X is transformed according to the following formula (Cutter et al., 2010; Petrovska & Mihajlovska, 2013):

$$Z = \frac{(X - X_{min})}{(X_{max} - X_{min})} \quad (5)$$

where X_{min} and X_{max} denote the minimum and maximum values of X , respectively. Through the Min–Max approach, the variables are standardized within the range of 0 to 1. As a result, the likelihood of the variables exhibiting a highly dispersed distribution is reduced. This standardization method allows all variables to be expressed in the same unit, thereby making it possible to combine them into a single index meaningfully.

4.2. Principles Component Analysis

The method employed to calculate the Quality Growth Index is PCA, one of the most widely used techniques (Abdi & Williams, 2010; Candès et al., 2011; Jolliffe, 2011). PCA is a statistical technique that transforms an original set of variables into a substantially smaller set of uncorrelated variables, which collectively capture most of the information contained in the original dataset (Dunteman, 1989). The purpose of PCA is to reduce a large number of variables into a single composite variable without causing significant loss of information (Hotelling, 1933). In this way, the multidimensionality of the variables is minimized. PCA was first introduced by Pearson (1901) and later developed by Hotelling (1933).

In order to explain the PCA, let's consider a set of $(X_1, X_2, X_3, \dots, X_p)$ variables. A PCA of this variable set can generate p new variables. It can also produce p new variables, known as principal components. While $PC_1, PC_2, PC_3, \dots, PC_p$ represent the principal components, b_s represent the principal components. Accordingly, the principal components can be expressed as follows (Abou-Ali & Abdelfattah, 2013):

$$PC_1 = b_{11}X_1 + \dots + b_{1p}X_p = Xb_1 \quad (6)$$

$$PC_p = b_{p1}X_1 + \dots + b_{pp}X_p = Xb_p \quad (7)$$

In other words, the matrix notation can be expressed as follows:

$$PC = Xb \quad (8)$$

This study constructs a new variable using the weights of each dimension derived from PCA4. Through this method, we obtain the foundations of quality growth using data on growth strength, growth stability, diversification of growth sources, and outward orientation of growth. Subsequently, we derive the social dimension of quality growth by combining health indicators into a health index and incorporating education data. Finally, we aggregate these two dimensions into a single index, referred to as the QGI. This composite structure enables the QGI to capture both the economic and social dimensions of quality growth in a coherent and measurable framework. Before proceeding to empirical applications of the index, it is essential to evaluate whether the constructed QGI reliably represents the concept it aims to measure. In this context, the subsequent section presents the validity analysis of the QGI.

4.3. Validity Analysis of the QGI

The measure of the linear relationship between variables is determined by the correlation coefficient. The correlation coefficient calculated between two variables indicates the degree to which they vary together. In short, correlation is a statistical method used to explain the relationship between two variables. If both variables increase or decrease in the same direction, the relationship is positive; if one increases while the other decreases, the relationship is negative. The correlation coefficient ranges between -1 and $+1$ (Schober et al., 2018). A high correlation coefficient suggests that the two variables are interdependent. Correlation analysis not only provides quantitative information about the strength of the relationship but also about its direction. Table 1 summarizes the conventional approach used in interpreting the correlation coefficient.

Table 1. Interpretation of the Correlation Coefficient

Correlation Coefficient in Absolute Terms	Conclusion
0.00-0.10	Negligible correlation
0.10-0.39	Weak correlation
0.40-0.69	Moderate correlation
0.70-0.89	Strong correlation
0.90-1.00	Very strong correlation

Source: Schober et al. (2018)

Table 2 presents the pairwise correlation results between the QGI and the variables tested for correlation. According to the table, a negligible correlation has been identified between the quality growth index and the per capita GDP growth rate and inequality variables. A weak correlation was found between the quality growth index and the variables of bureaucracy, rule of law, corruption, and foreign aid. In addition, a moderate correlation was found between the quality growth index and government stability and foreign direct investment. Furthermore, a strong correlation was found between the quality growth index and poverty, inflation, credit to the private sector, health expenditure, education expenditure, and workers' remittances. Finally, a very strong correlation was found between the quality growth index and the human development index variable.

Table 2. Correlation Coefficients Between Variables and the Quality Growth Index

Variables	Correlation	Conclusion
Human development index	0.96	Very strong correlation
Per capita GDP growth rate	0.04	Negligible correlation
Poverty	-0.79	Strong correlation
Inequality	0.08	Negligible correlation
Bureaucracy	-0.21	Weak correlation
Rule of law	-0.26	Weak correlation
Corruption	0.12	Weak correlation
Government stability	-0.50	Moderate correlation
Inflation	-0.77	Strong correlation
Credit to the private sector	0.83	Strong correlation

⁴ PCA outputs are presented in Appendix C.

Health expenditure	0.78	Strong correlation
Education expenditure	0.88	Strong correlation
Foreign direct investment	0.65	Moderate correlation
Workers' remittances	-0.87	Strong correlation
Foreign aid	-0.36	Weak correlation

Source: Author's own calculations

5. MODEL AND DATA

The validity of Okun's Law in the Turkish economy will be investigated within the frameworks of (i) the first differences model, (ii) the dynamic model, and (iii) the asymmetric model. We use annual data over the period 1990-2019. In this context, the first differences model specified in equation (1), the dynamic model specified in equation (3), and the asymmetric model specified in equation (4) will be estimated.

Unemployment rate data are obtained from the official database of the Turkish Statistical Institute, while real GDP per capita data are drawn from the World Development Indicators (WDI) database. The Quality Growth Index is constructed from six sub-indicators using the Principal Component Analysis (PCA) method. These sub-indicators are growth strength, growth stability, diversification of growth sources, outward orientation of growth, health, and education. Appendix B summarizes the dependent and independent variables included in the model, along with their definitions, data sources, and time coverage.

6. ESTIMATION STRATEGY

6.1. Ordinary Least Squares Method

The ordinary least squares (OLS) method is one of the most frequently used estimation methods in econometric modelling and regression analysis. OLS is an estimation technique that aims to minimise the sum of residual squares (Gujarati, 2022). The OLS regression method model is as follows:

$$Y_t = \alpha + \beta X_t + \varepsilon_t \quad (9)$$

The regression parameters α and β presented here are the error terms ε_t . Y_t is the dependent variable and X_t is the independent variable. After obtaining the estimated values of the parameters given in Equation (9), the significance of these parameters is tested using the following hypotheses.

$$H_0: \beta = 0 \quad (10)$$

$$H_1: \beta \neq 0 \quad (11)$$

Failure to reject the null hypothesis indicates that there is no linear relationship between the dependent variable and the independent variable. With regard to the validity of the estimates, significance tests must be performed.

6.2. ARDL and NARDL Boundary Test Approach

The ARDL (Autoregressive Distributed Lag) bounds test approach developed by Pesaran et al. (2001) offers a significant methodological innovation by enabling the joint analysis of series with different degrees of stationarity (I(0) and I(1)). The ARDL model is widely preferred in the literature because it produces reliable results for small samples and can estimate both short-term and long-term relationships simultaneously.

$$\Delta Y_t = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2 X_{t-1} + \sum_{i=1}^l \theta_i \Delta Y_{t-i} + \sum_{i=0}^m \delta_i \Delta X_{t-i} + \varepsilon_t \quad (12)$$

If $\gamma_1 = \gamma_2 = 0$ in Equation (12), it will be concluded that there is no cointegration relationship between Y (dependent variable) and X (independent variable).

The Nonlinear Autoregressive Distributed Lag (NARDL), an enhanced version of the ARDL model, was proposed by Shin et al. (2014). This approach allows for the analysis of asymmetric relationships based on the assumption that positive and negative changes in independent variables may have different effects

on the dependent variable. Thus, the NARDL model retains all the advantages of ARDL while also modelling the non-linear dynamics between variables.

While the ARDL model allows for the analysis of long-term linear relationships between variables, the NARDL model reveals the asymmetric and non-linear nature of these relationships. Therefore, the NARDL method is a more appropriate choice in situations involving stationary variables at both the I(0) and I(1) levels, where the positive/negative effects of the variables may differ. Furthermore, the NARDL method has been used in numerous recent studies (Iqbal et al., 2022; Sohail et al., 2021; Udeagha & Ngepah, 2021).

In this model, the explanatory variable X_t is first decomposed as in the following equation. The approach reveals short-term and long-term non-linearity through the positive and negative partial sum decomposition of the explanatory variables.

$$X_t = X_0 + X_t^+ + X_t^- \quad (13)$$

Shin et al. (2014) demonstrate that a variable can be decomposed into positive and negative shocks via partial sums. For example, X_t^+ represents the positive shock of the independent variable, while X_t^- represents the negative shock of the independent variable. X_t^+ and X_t^- in Equation (13) are the partial sum processes of the positive and negative changes in X_t and are obtained as follows:

$$X_t^+ = \sum_{i=1}^t \Delta X_i^+ = \sum_{i=1}^t \max(\Delta X_i, 0) \quad (14)$$

$$X_t^- = \sum_{i=1}^t \Delta X_i^- = \sum_{i=1}^t \min(\Delta X_i, 0) \quad (15)$$

For this purpose, the asymmetric long-term regression of the relationship between the Y and X variables has been formulated. Therefore, the non-linear (asymmetric) long-term relationship is as follows in the equations below:

$$Y_t = \alpha + \beta^+ X_t^+ + \beta^- X_t^- + \varepsilon_t \quad (16)$$

In equation (16), β^+ , X_t^+ , β^- and X_t^- are the long-term asymmetric parameters for positive and negative changes. Finally, the asymmetric relationship between the variables Y and X is obtained by combining equations (12) and (16), that is, by including a new set of positive and negative changes, the NARDL(l, m) equation is obtained as follows:

$$\Delta Y_t = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2^+ X_{t-1}^+ + \gamma_2^- X_{t-1}^- + \sum_{i=1}^l \theta_i \Delta Y_{t-i} + \sum_{i=0}^m \delta_i^+ \Delta X_{t-i}^+ + \sum_{i=0}^m \delta_i^- \Delta X_{t-i}^- + \varepsilon_t \quad (17)$$

Shin et al. (2014) proposed the F_{pss} statistic to test for cointegration among the selected variables. In the F_{pss} test, the null hypothesis $H_0: \gamma_1 = \gamma_2^+ = \gamma_2^- = 0$ indicates that there is no cointegration. Rejection of the null hypothesis indicates the presence of a cointegration relationship between the variables.

The Δ in Equation (17) is the first differences operator; γ , θ and δ are the estimated parameters. In addition, γ_0 is the constant term; γ_1 and γ_2 are the long-term coefficients, while θ_i and δ_i represent the short-term coefficients. Here, l and m denote the optimal lag (lag length). The long-term parameters of the Y and X variables are as follows:

$$\beta^+ = -\frac{\gamma_2^+}{\gamma_1} \quad (18)$$

$$\beta^- = -\frac{\gamma_2^-}{\gamma_1} \quad (19)$$

In addition, the long-term asymmetric effect of the independent variable on the dependent variable has been determined. The null hypothesis rejecting the long-term asymmetric effect of the independent variable on the dependent variable is $H_0: \beta^+ = \beta^-$. Rejecting the null hypotheses indicates the existence of an asymmetric relationship between the variables. The short-term asymmetric relationship between the Y and X variables is tested with the hypothesis $H_0: \delta_i^+ = \delta_i^-$. Rejecting the null hypothesis indicates that there is a short-term asymmetric relationship between the dependent variable and the independent variable.

7. Findings

7.1. Unit Root Test Results

Table 3 reports the results of the unit root tests for all variables. The unit root tests were conducted using the lag length determined by the modified Akaike Information Criterion proposed by Perron and Qu (2007) in both trend and constant specifications. The results obtained from both procedures indicate that all variables are integrated of I(1).

Table 3. Results of the ADF and DF-GLS Unit Root Test

Variables	ADF	DF-GLS
U	-1.014	-1.026
Y	0.775	1.324
QGI	-1.875	-0.316
ΔU	-4.251***	-4.350***
ΔY	-4.855***	-4.919***
ΔQGI	-4.684***	-4.240***
Significance		
1%	-3.67	-2.64
5%	-2.96	-1.95
10%	-2.62	-1.61

Note: The Δ symbol represents the first differences (difference operator) of the relevant variable. The analyses include a constant term and trend. The lag length was determined based on the modified AIC, considering Perron and Qu (2007). The maximum lag length was set to 1. The ***, **, and * following the calculated test statistics for the variables indicate that they are stationary at the 1%, 5%, and 10% significance levels, respectively.

7.2. Parameter Estimation Results

7.2.1. First Differences Model

Within the framework of the first differences model, according to Table 4, it has been determined that the coefficients of economic growth and quality growth are statistically significant. Accordingly, a one-unit increase in income change reduces unemployment change by 2,123 units, while a one-unit increase in quality growth change reduces unemployment change by 3,585 units. In the first differences model it was determined that a one-unit increase in quality growth would reduce unemployment more than an increase in economic growth. In addition, to assess the validity of the model, some diagnostic tests were performed in both models. As a result of these diagnostic tests, it was determined that there was no problem in interpreting the results of the regression analysis and that the model's estimation results were reliable.

Table 4. Findings Obtained from the First Differences Model

Y			QGI	
Variables	Coefficient		Variables	Coefficient
DY	-2,123***	[0,521]	DQGI	-3,585*[1,505]
C	0,676***	[0,207]	C	0,390*[0,218]
Diagnostic Test Results				
R ²	0,371		0,103	
Adjusted R ²	0,349		0,070	
F-statistic	16,573***		3,119*	
	Statistic	Probability	Statistic	Probability
Breusch-Godfrey LM Test	0,394	0,51	0,008	0,92
Breusch-Pagan-Godfrey Test	0,479	0,47	3,021	0,08
Jarque-Bera	0,108	0,94	0,225	0,89
Ramsey RESET Test	0,001	0,98	2,137	0,15

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Values in square brackets indicate standard errors. The Breusch–Godfrey LM test checks for autocorrelation, the Breusch–Pagan–Godfrey test examines heteroskedasticity, the Jarque–Bera test assesses normality, and the Ramsey RESET test evaluates model specification errors.

Figure 2 shows the CUSUM test graphs for the first differences model using the economic growth indicator; Figure 3 shows the CUSUM test graphs for the first differences model using the quality growth indicator. According to these graphs, it was concluded that there was no structural break during the study period in either case.

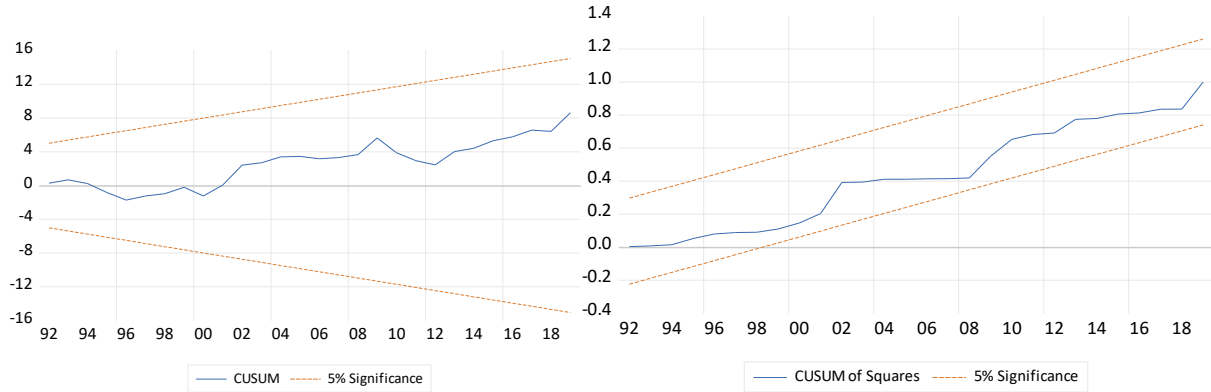


Figure 2. CUSUM and CUSUMQ Between Unemployment and Per Capita Real GDP within the First Differences Model Framework

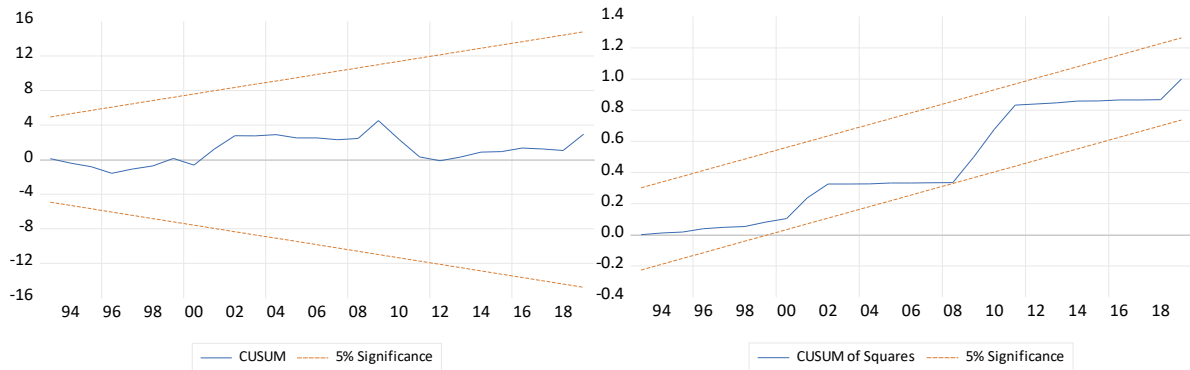


Figure 3. CUSUM and CUSUMQ Between Unemployment and QGI within the First Differences Model Framework

7.2.2. Dynamic Model

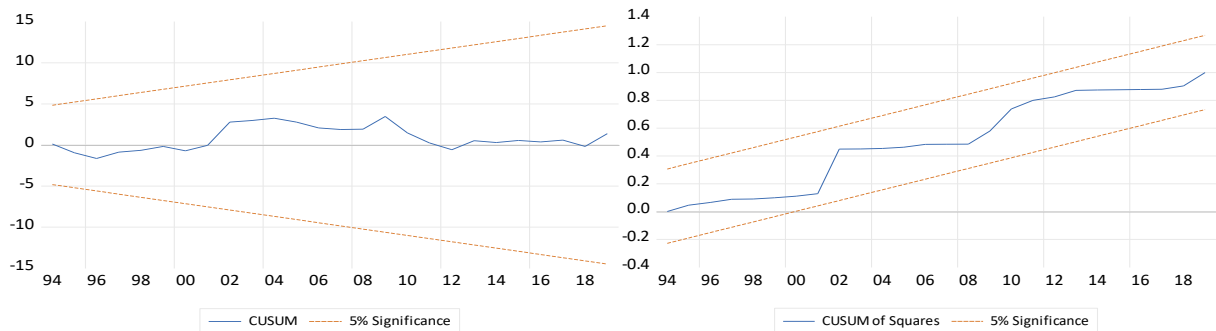
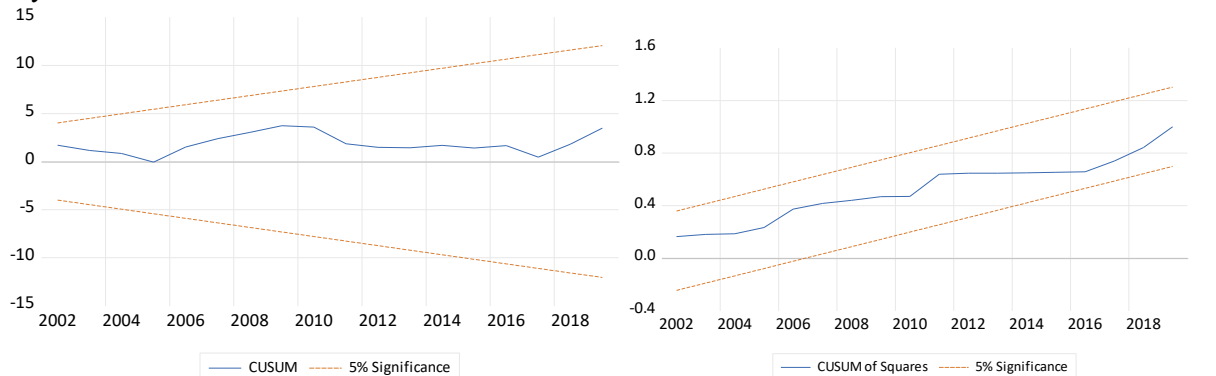
According to the results presented in Table 5, the coefficients of economic growth and quality growth are statistically significant. Accordingly, a one-unit increase in income change reduces the change in unemployment in the current period by 2,124 units, while a one-unit increase in quality growth change reduces the change in unemployment in the current period by 3,635 units. In the dynamic model, it was found that a one-unit increase in quality growth would reduce unemployment more than an increase in economic growth. In both cases, it was concluded that the first lag coefficient of the unemployment rate and the first lag coefficient of economic growth, as well as the first and second lag coefficients of quality growth, are not statistically significant, while the third and fourth lag coefficients of quality growth are statistically significant. Furthermore, to assess the validity of the model, some diagnostic tests were performed on both models. The results of the diagnostic tests also showed that there was no problem in interpreting the results of the regression analysis and that the model's estimation results were reliable.

Table 5. Findings Obtained from the Dynamic Model

Y		QGI		
Variables	Coefficient	Variables	Coefficient	
DY	-2,124***[0,550]	DQGI	-3,635*[1,971]	
DU(-1)	0,133[0,217]	DU(-1)	0,245[0,245]	
DY(-1)	0,205[0,697]	DQGI(-1)	-1,676[2,001]	
C	0,617**[0,280]	DQGI(-2)	1,870[1,946]	
		DQGI(-3)	4,939**[2,020]	
		DQGI(-4)	-5,867***[2,248]	
		C	0,410[0,336]	
Diagnostic Test Results				
R2	0,379		0,544	
Adjusted R2	0,304		0,392	
F-statistic	5,089***		3,584**	
	Statistic	Probability	Statistic	Probability
Breusch-Godfrey LM Test	0,001	0,99	0,012	0,89
Breusch-Pagan-Godfrey Test	3,425	0,09	0,715	0,56
Jarquera Bera	0,006	0,99	0,633	0,72
Ramsey RESET Test	9,82E	0,99	0,026	0,87

Note: ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively. Figures in brackets represent standard errors. The maximum lag length was determined using the Akaike Information Criterion (AIC). Diagnostic tests: Breusch–Godfrey LM Test (autocorrelation), Breusch–Pagan–Godfrey Test (heteroskedasticity), Jarque–Bera Test (normality), and Ramsey RESET Test (model specification).

Figures 4 and 5 show the CUSUM test graphs for the dynamic model using the economic growth indicator and the quality growth indicator, respectively. According to these graphs, it was concluded that there was no structural break during the study period in either case.


Figure 4. CUSUM and CUSUMQ Between Unemployment and Per Capita Real GDP within the Dynamic Model Framework

Figure 5. CUSUM and CUSUMQ Between Unemployment and QGI within the Dynamic Model Framework

7.2.3. Asymmetric Model

When examining the relationships between the unemployment rate and per capita real GDP, and between the unemployment rate and quality growth, a cointegration test was conducted for non-linear characteristics, and the results of the boundary test are presented in Panel A of table 6. According to the results, the cointegration boundary test results were determined as 2,727 and 2,028 for real GDP per capita and quality growth, respectively. This result indicates that the two variables do not move in tandem with unemployment in the long term.

Panel B of table 6 reveals the symmetric and asymmetric relationships between the variables in the long and short term. According to the results, in the long term, the relationship of both variables with unemployment is symmetric, while in the short term, only the quality growth index has an asymmetric relationship with unemployment.

Table 6. Cointegration Bounds Test and Presence of Asymmetry

Panel A	Model	F-Statistic	Lower Bound (10%)	Upper Bound (10%)
	Y	2,727	3,437	4,470
	QGI	2,028	3,437	4,470
Panel B	Model	Long-Run	Short-Run	
	Y	1,006	0,044	
	QGI	0,164	4,934**	

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. The critical values in Panel A are based on a finite sample size of $n = 30$.

As no long-term asymmetric relationship was found between the variables, a potential short-term asymmetric relationship will be investigated. Notice that the long-run coefficients obtained from this model should be interpreted with caution and should not be regarded as evidence of a stable equilibrium relationship, and the analysis primarily focuses on short-run dynamics and adjustment processes⁵. In this context, the asymmetric model expressed in equation (13) has been updated as follows:

$$\Delta Y_t = \gamma_0 + \sum_{i=1}^l \theta_i \Delta Y_{t-i} + \sum_{i=0}^m \delta_i^+ \Delta X_{t-i}^+ + \sum_{i=0}^m \delta_i^- \Delta X_{t-i}^- + \varepsilon_t \quad (20)$$

The results obtained by estimating Equation (20) are presented in Table 7. It has been determined that in the short term, the quality growth index has a greater impact on unemployment than per capita real GDP. It was found that a one-unit increase in per capita real GDP would reduce unemployment by 0.002 units. The effect of a decrease in per capita real GDP was not found to be statistically significant. It was determined that a one-unit increase in the change in quality growth would reduce the change in unemployment by 1.587 units; a one-unit decrease in the change in quality growth would increase the change in unemployment by 1.488 units. This finding shows that the short-term relationship between quality growth and unemployment in Türkiye is not symmetrical. The fact that positive shocks to quality growth in the short term cause a greater decrease in unemployment than the increase in unemployment caused by negative shocks demonstrates the resilience of the labour market during periods of high-quality growth. Furthermore, the short-term findings obtained from the asymmetric model indicate that a one-unit increase in quality growth will reduce unemployment more than an increase in economic growth.

⁵ Although no cointegration relationship is detected, the NARDL framework is retained in this study to capture short-run asymmetric dynamics and sign-dependent adjustment processes. Unlike static asymmetric OLS models based solely on differenced variables, NARDL allows for a dynamic specification with lagged responses and decomposed positive and negative shocks. Therefore, its use is motivated not by long-run equilibrium analysis, but by its ability to model short-run asymmetry and dynamic adjustment mechanisms.

Table 7. Findings from the Asymmetric Model (Short Run)

Y		QGI	
Variables	Coefficient	Variables	Coefficient
U(-1)	0,095[0,175]	U(-1)	-0,004[0,007]
Y^+	-0,002**[0,001]	QGI^+	-1,587***[0,059]
Y^-	-0,002[0,001]	QGI^-	1,488***[0,157]
C	0,664*[0,384]	C	0,299***[0,007]
Diagnostic Test Results			
	Y		QGI
R2	0,708		0,684
Adjusted R2	0,675		0,646
F-statistic	21,078***		18,086***
	Statistic (Probability)		Statistic (Probability)
Breusch-Godfrey LM Test	0,433 (0,46)		0,005 (0,93)
Breusch-Pagan-Godfrey Test	0,893 (0,43)		0,867 (0,46)
Jarque-Bera	1,200 (0,54)		0,841 (0,65)
Ramsey RESET Test	0,001 (0,97)		0,752 (0,39)

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively. Values in square brackets indicate standard errors. The maximum lag lengths of the asymmetric model were determined according to AIC. Diagnostic tests: Breusch–Godfrey LM Test (autocorrelation), Breusch–Pagan–Godfrey Test (heteroskedasticity), Jarque–Bera Test (normality), and Ramsey RESET Test (model specification). Lagged values of Y and QGI variables are not reported.

Some diagnostic tests were performed to assess the adequacy of the model. The results of the diagnostic tests showed that there were no issues with interpreting the results of the regression analysis and that the model's prediction results were reliable.

Figures 6 and 7 show the CUSUM test graphs for the asymmetric model, where the economic growth indicator is used in Figure 6 and the quality growth indicator is used in Figure 7. According to these graphs, it is concluded that there was no structural break during the study period in either case.

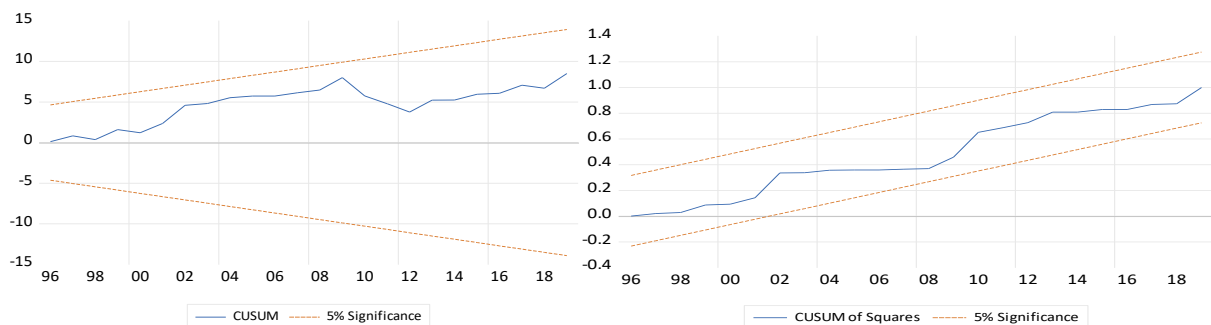
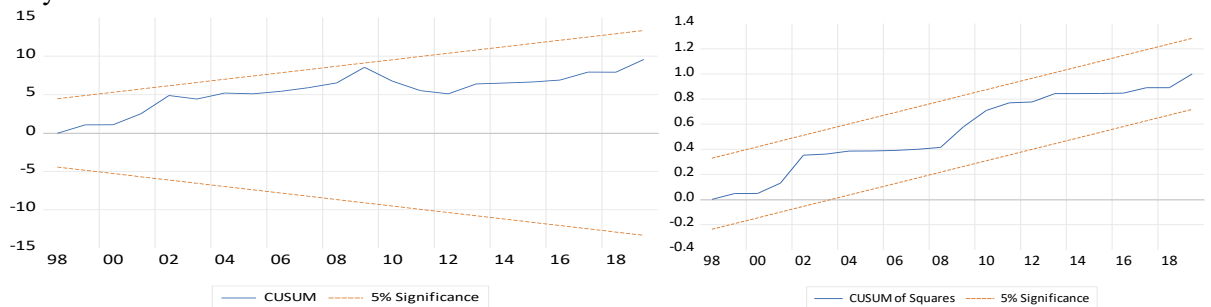

Figure 6. CUSUM and CUSUMQ Between Unemployment and Per Capita Real GDP within the Asymmetric Model Framework

Figure 7. CUSUM and CUSUMQ Between Unemployment and QGI within the Asymmetric Model Framework

Table 8 summarises the Okun coefficients obtained from three different model specifications. Since GDP growth and the QGI are measured on different scales, direct comparison of coefficient magnitudes may be misleading. To ensure comparability, we re-estimate the baseline models using standardized variables via an IQR-based approach. While standardized beta coefficients are commonly used to address scale differences across regressors, their interpretation may be distorted when the variables exhibit substantially different levels of variability. In the present study, conventional growth is proxied by the first difference of per capita income, which displays considerably higher dispersion than the bounded QGI. In such settings, standardized coefficients may primarily reflect volatility differences rather than economically meaningful variation. To mitigate this concern, we complement the analysis with an interquartile range (IQR)-based impact measure. By focusing on the typical variation captured by the difference between the 75th and 25th percentiles, the IQR-based approach provides a robust and scale-independent comparison of the unemployment response to representative changes in each explanatory variable. Therefore, we also report IQR results in Table 8 alongside the regression coefficients to ensure comparability.

Table 8. Findings from the Difference, Dynamic, and Asymmetric Models

	First Differences Model		Dynamic Model		Asymmetric Model	
	Regression Coefficient	IQR-based	Regression Coefficient	IQR-based	Regression Coefficient	IQR-based
Y	-2,123***	-0,105	-2,124***	-0,105		
QGI	-3,585*	-1,01	-3,635*	-1,024		
Y ⁺					-0,002**	-0,000099
Y ⁻					-0,002	-0,000099
QGI ⁺					-1,587***	-0,4473
QGI ⁻					1,488***	0,4194

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Reported coefficients for the dynamic model refer to variables without lags.

7.3. Ethics Committee Approval

This research complied with ethical principles throughout the conceptual framework, application of data collection tools, data collection, analysis, and interpretation of the data. The ANKAD Editorial Board assumes no responsibility for any ethical violations encountered. All responsibility lies with the authors. I hereby declare that this work has not been submitted for evaluation to any academic publication platform other than ANKAD. All rules specified in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" have been adhered to in this study. None of the actions specified in the second section of the directive, "Actions Contrary to Scientific Research and Publication Ethics," have been taken. The data used in this research were obtained from publicly available databases, including the Turkish Statistical Institute and the World Bank World Development Indicators. Therefore, since the document analysis technique was used, ethics committee approval was not required.

8. POLICY IMPLICATIONS AND DISCUSSIONS

This study provides an important implication for future unemployment projections (forecasting models). Specifically, unemployment projections that use GDP growth as the explanatory variable instead of quality growth may lead to inaccurate estimates of the number of unemployed (or the unemployment rate). This conclusion becomes even more important during periods of economic downturn when cyclical unemployment rises. As a potential consequence, if a scenario arises in which the actual number of unemployed exceeds the projected figure⁶, the likelihood that policies designed to combat unemployment will fail to achieve their targets will increase. This conclusion becomes even more important during periods of economic contraction when cyclical unemployment rises.

However, the findings emphasize the importance of prioritizing quality growth when developing policies to combat unemployment in Türkiye. Accordingly, a number of policy recommendations can be

⁶ The findings of the study point to a high likelihood of this scenario materializing.

developed given the empirical results in this study. First, investing in health and education can help increase quality growth to combat unemployment. The strong link between quality growth and low unemployment rates highlights the strategic role of health and education in a country's economic structure. Investments in these areas not only increase social welfare and the quality of human capital but also directly contribute to job expansion and a reduction in unemployment rates. In this context, increasing financial resources allocated to educational institutions, regularly updating curricula in line with labor market needs, and strengthening public health infrastructure are among the key policy tools.

Diversifying economic sectors also matters in the fight against unemployment. A strategic sectoral structure approach prevents economic growth from being concentrated in a limited number of sectors, thus enabling a more inclusive and balanced growth process. Policies developed in this direction should aim to increase sectoral diversity, support new and emerging sectors, and strengthen their job-creating capacity. In this way, the spread of economic activity across a broad base can be ensured, making the positive effects on the labor market permanent.

Third, ensuring the stability of economic growth can also assist policymakers. Reducing fluctuations in the economic growth process should be among the fundamental priorities of sustainable development. To this end, it is important to create policy frameworks that encourage both domestic and foreign investment, increase the depth and efficiency of financial markets, and establish a robust financial structure that will strengthen the economy's resilience to external shocks. Strengthening the financial sector, along with achieving stability in economic growth, will contribute to a healthier functioning of the economic system; thus, by reducing irregularities in resource allocation, it will support increased employment.

Fourth, balancing demand composition can work as a strong mechanism. Achieving a balanced structure between domestic and external demand factors increases the economy's resilience to external shocks, contributing to stable growth and the maintenance of sustainable employment levels. Policy tools implemented within this framework may include supporting domestic production and industries, developing effective trade policies to improve the structure of foreign trade, and strengthening domestic demand through fiscal policies. In this way, economic stability and employment continuity will be supported by reducing imbalances in the demand structure.

Five, harnessing the growth potential would be useful in this issue. Focusing on the intrinsic power of growth allows for the development of policy frameworks that ensure economic activity provides real added value to the economy. Policies formulated in this direction will significantly support job creation while also contributing to sustainable economic progress.

Last but not least, leveraging the pro-poor nature of quality growth can be crucial. Quality growth stands out for its strong, stable, and sustainable structure, as well as its ability to increase productivity and contribute to poverty reduction. Supporting this type of growth process enables an increase in living standards and social welfare, while also creating a more favorable economic environment for expanding employment opportunities. Therefore, promoting high-quality growth with pro-poor characteristics can be considered a critical policy tool for inclusive growth and sustainable job creation.

In conclusion, Türkiye's strategy to combat unemployment needs to address economic growth not only through quantitative indicators but also from a more comprehensive and qualitative perspective. The empirical findings of this study reveal that high-quality growth is a stronger predictor of unemployment trends; this indicates that future policies should prioritize a multidimensional and holistic approach. This approach not only accelerates economic activity but is also robust, sustainable, pro-poor and socially beneficial, enabling lasting success in combating unemployment.

9. CONCLUSION

This study investigates the validity of Okun's Law in the Turkish economy during the period 1990-2019. It also revises the analysis of Okun's Law in Türkiye by using a quality growth index that can address the layers of economic growth from a broader perspective. To this end, the QGI proposed by Mlachila, Tapsoba and Tapsoba (2017) for developing economies has been calculated. The main hypothesis put forward in this context is that 'quality growth will reduce unemployment more than quantitative

expansion measured by GDP growth. To test the hypothesis, Okun's Law's first differences model, dynamic model, and asymmetric model were used with annual data from 1990 to 2019.

When the findings obtained from empirical analyses are evaluated in general, it has been determined that the negative effect of quality growth on unemployment is greater than the negative effect of quantitative growth. This finding is consistent with the results obtained from Okun's Law's first differences model, dynamic model, and asymmetric model. When the empirical analysis results are evaluated in terms of the proposed hypothesis, it has been determined that the hypothesis, which states that 'quality growth will reduce unemployment more than quantitative expansion measured by GDP growth,' has been confirmed by the findings.

In developing economies, growth is not merely about increasing national income; it is a vital factor concerning the welfare and livelihoods of the entire population. Similarly, unemployment is not merely a statistic; it is a critical indicator with social and economic costs. Therefore, understanding the validity and consequences of Okun's Law in developing countries such as Türkiye is a critical step towards creating policies that align with the goals of welfare-enhancing expansion and job creation. In this context, a strategic transformation by policymakers has become inevitable. Developing countries must act not only with policies aimed at rapid economic growth but also with a strategic vision focused on quality-oriented inclusive growth. Policies must be revised to support the fundamental elements of quality growth, ensuring that every segment of society benefits from economic development. This approach is indispensable in combating unemployment.

Based on the scope of the present study, it is possible to offer some recommendations to researchers who will conduct future studies on this topic. Firstly, in order to emphasise the inclusiveness and sustainability of growth, researchers can analyse its impact on unemployment by considering the quality growth index from a broader perspective (including dimensions such as institutional quality and environmental quality). Secondly, by estimating the non-linear threshold effect of growth on unemployment, the threshold values obtained for quantitative growth and quality growth variables can be compared. Thirdly, the framework employed in this study does not explicitly model simultaneity relationships. However, this choice is consistent with the empirical purpose of the paper, which is not to identify the direct causal effect of QGI on unemployment, but to examine whether the Okun relationship differs across alternative levels of growth quality. Accordingly, the estimated coefficients should be interpreted as regime-specific or conditional associations rather than as causal effects running from QGI to unemployment. Addressing this potential endogeneity through instrumental variable approaches or structural modeling strategies therefore remains an important avenue for future research. Finally, structural breaks in the Turkish economy during the sample period, particularly the 1994, 2001, 2008, and 2018 crisis episodes, constitute another limitation. These breaks are not explicitly included in the baseline model because their consistent treatment would require the Okun-type regression structure itself to vary across break dates or regimes, which is difficult to implement with the limited time dimension of the dataset. Therefore, the estimated coefficients should be interpreted as average full-sample relationships rather than stable parameters across all crisis and non-crisis periods. If the growth–unemployment relationship changes across structural episodes, the reported coefficients may mask regime-specific heterogeneity. Future studies may address this issue through break-adjusted or regime-sensitive modeling strategies.

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APPENDIX

Appendix A. Table of Variables

Variable	Measurement	Source
GDP Per Capita Growth Rate	Represents the annual change in output per person.	World Development Indicators (WDI)
Herfindahl-Hirschman Index (HHI)	An export product diversification index that measures market concentration by emphasizing the individual market shares of firms.	World Integrated Trade Solution (WITS)
Net External Demand (as % of GDP)	Shows the share of net external demand as a percentage of GDP.	WDI
Infant Mortality Rate	Indicates the number of infants dying before reaching one year of age per 1,000 live births in a given year.	WDI
Life Expectancy at Birth	Represents the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	WDI
Mean Years of Schooling	Indicates a country's level of education.	United Nations Development Programme (UNDP)

Appendix B. List of Variables Used in the Study

Variable	Description	Data Source	Period
U	Unemployment Rate	Turkish Statistical Institute (TÜİK)	1990-2019
Y	Real GDP per Capita GDP (in 2015 constant US dollars)	WDI	1990-2019
QGI	Quality Growth Index	It has been created by us using the Principal Component Analysis method.	1990-2019

Appendix C. PCA Output

Panel 1. Summary of Principal Component Analysis (PCA): Growth Fundamentals			
Component	Eigenvalue	% of Variance	Cumulative %
1	1.777	44.42	44.42
2	1.203	30.06	74.48
3	0.728	18.19	92.68
4	0.293	7.31	100.00
Panel 2. Summary of Principal Component Analysis (PCA): Social Outcomes			
Component	Eigenvalue	% of Variance	Cumulative %
1	1.983	99.12	99.15
2	0.017	0.88	100.00
Panel 3. Summary of Principal Component Analysis (PCA): QGI			
Component	Eigenvalue	% of Variance	Cumulative %
1	1.524	76.20	76.19
2	0.476	23.80	100.00

Araştırma Makalesi / Research Article

Quality Growth and Okun's Law in Türkiye

Türkiye'de Kaliteli Büyüme ve Okun Yasası

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DOI : [10.63556/ankad.v10i3.427](https://doi.org/10.63556/ankad.v10i3.427)

Geliş/Received: 19/01/2026

Kabul/Accepted: 13/05/2026

GENİŞLETİLMİŞ ÖZET

Giriş

Ekonomik büyüme ve işsizlik arasındaki ilişki, makroekonomi teorisi ve politika analizinde on yıllardır merkezi bir konu olmuştur. Bu ilişkiyi ele alan en etkili çerçevelerden biri, Arthur Okun (1962) tarafından ortaya atılan ve çıktı büyümesi ile işsizlik arasında ters bir ilişki olduğunu öne süren Okun Yasası'dır. Okun Yasası gelişmiş ekonomilerde kapsamlı bir şekilde test edilmiş olsa da, işgücü piyasalarının genellikle yapısal katılıklar, kayıt dışılık, demografik baskılar ve değişken büyüme dinamikleriyle karakterize edildiği gelişmekte olan ekonomilerde geçerliliği ve istikrarı daha belirsizdir.

Türkiye, Okun Yasası'nı yeniden incelemek için özellikle önemli bir örnek teşkil etmektedir. 1990'ların başından bu yana, Türkiye ekonomisi, ticaret liberalleşmesi, finansal derinleşme, yapısal reformlar ve makroekonomik istikrarsızlık dönemleri de dahil olmak üzere önemli ekonomik, politik ve kurumsal dönüşümler geçirmiştir. Güçlü ekonomik büyüme dönemlerine rağmen, işsizlik—özellikle genç ve uzun süreli işsizlik—sürekli olarak yüksek seviyelerde kalmıştır. Bu paradoks, Türkiye'deki büyümenin yeterince kapsayıcı veya istihdam yaratıcı olmayabileceğini düşündürmektedir. Sonuç olarak, yalnızca GSYH büyümesi gibi nicel göstergelere dayanmak, büyüme-işsizlik ilişkisi konusunda yanıltıcı sonuçlara yol açabilir.

Son teorik ve ampirik tartışmalar, ekonomik büyümenin yalnızca büyüklüğüyle değil, kalitesiyle de değerlendirilmesi gerektiğini vurgulamaktadır. Kapsayıcı büyümeyle yakından ilişkili olan kaliteli büyüme kavramı, büyümenin sürdürülebilir, istikrarlı, verimliliği artırıcı ve yoksulluğun azaltılması, eşitlik ve istihdam yaratma açısından sosyal olarak faydalı olup olmadığını ortaya koymaktadır. Bu perspektiften yola çıkarak, Mlachila vd. (2017), hem içsel büyüme özelliklerini hem de sosyo-ekonomik sonuçları yakalayan kapsamlı bir Kaliteli Büyüme Endeksi (QGI) önermektedir. Bununla birlikte, bu endeksin ampirik uygulamaları sınırlı kalmakta ve işgücü piyasası dinamikleri üzerindeki etkileri Okun Yasası çerçevesinde henüz incelenmemiştir.

Bu bağlamda, bu çalışmanın temel amacı, ekonomik büyümenin kaliteye göre ayarlanmış bir ölçüsünü dahil ederek, 1990-2019 dönemi boyunca Türkiye'de Okun Yasası'nın geçerliliğini yeniden değerlendirmektir. Merkezi hipotez, kalite büyümesinin, geleneksel GSYH tabanlı büyümeye göre işsizliği daha etkili bir şekilde azalttığıdır. Bu çalışma, Okun Yasası'nı Kaliteli Büyüme Endeksini kullanarak yeniden gözden geçirme girişiminin ilk örneğini temsil etmekte ve böylece hem kavramsal hem de ampirik olarak literatüre katkıda bulunmaktadır.

Model ve Yöntem

Ampirik analiz Türkiye ekonomisine odaklanmakta ve 1990-2019 yılları arasındaki yıllık dönemi kapsamaktadır. İşsizlik, iki alternatif yöntemle ölçülen ekonomik büyümenin bir fonksiyonu olarak

modellenmiştir: geleneksel kişi başına reel GSYH büyümesi ve kaliteye göre ayarlanmış bir büyüme göstergesi. Kaliteli Büyüme Endeksi, Mlachila vd. (2017) tarafından önerilen çerçeveye göre hesaplanmıştır. Ancak önemli bir metodolojik yenilik içermektedir. Endeksin alt bileşenleri için eşit ağırlıklar varsaymak yerine, bu çalışma, veriye dayalı ağırlıkları belirlemek için Temel Bileşen Analizi (PCA) kullanmaktadır. Bu da kaliteli büyümenin her boyutunun göreceli öneminin daha doğru bir şekilde temsil edilmesini sağlamaktadır.

Okun Yasası'nın farklı spesifikasyonlar altında sağlamlığını test etmek için üç ekonometrik model kullanılmıştır: fark modeli, dinamik model ve asimetrik model. Bu modeller, büyüme-işsizlik ilişkisindeki kısa vadeli dinamikleri, gecikmeli etkileri ve potansiyel doğrusal olmayan ilişkileri yakalamaktadır. Metodolojik odak ve tutarlılığı korumak için açık modeli ile uyumlaştırılmış trend ve esneklik modeli kasıtlı olarak dışlanmıştır. Okun Yasası hipotezinde kullanılan üç model tahmin etmek için En Küçük Kareler (OLS) ve Doğrusal Olmayan Gecikmesi Dağıtılmış Otoregresif (NARDL) sınır testi yöntemleri kullanılmıştır.

Bulgular ve Tartışma

Bu çalışma, 1990-2019 dönemi boyunca Türkiye ekonomisinde Okun Yasası'nın geçerliliğini incelemektedir. Bunu yaparken, ekonomik genişlemenin çok boyutlu doğasını yakalayan bir büyüme kalitesi perspektifi ekleyerek Okun Yasası'nın geleneksel analizini genişletmektedir. Bu amaçla, Mlachila, Tapsoba ve Tapsoba (2017) tarafından gelişmekte olan ekonomiler için geliştirilen Kaliteli Büyüme Endeksi Türkiye için hesaplanmıştır. Çalışmanın temel hipotezi, nitelikli büyümenin, GSYH ile ölçülen niceliksel büyümeden daha güçlü bir işsizliği azaltıcı etkiye sahip olduğunu öne sürmektedir. Bu hipotezi ampirik olarak test etmek için, Okun Yasası, 1990-2019 dönemini kapsayan yıllık veriler kullanılarak fark modeli, dinamik model ve asimetrik model ile tahmin edilmiştir.

Ampirik bulgular, çalışmanın temel hipotezini tutarlı bir şekilde desteklemektedir. Fark modelinden elde edilen sonuçlar, hem ekonomik büyümenin hem de kaliteli büyümenin işsizliği önemli ölçüde azalttığını ortaya koymaktadır; ancak etkinin büyüklüğü kaliteli büyüme için önemli ölçüde daha fazladır. Özellikle, kaliteli büyümedeki bir birimlik artış, GSYH bazlı büyümedeki benzer bir artıştan daha fazla işsizliği azaltmaktadır ve bu da yüksek kaliteli büyümenin üstün istihdam yaratma kapasitesini vurgulamaktadır.

Dinamik model, kaliteli büyümenin işsizlik azalması üzerinde geleneksel büyümeden daha güçlü bir eş zamanlı etki gösterdiğini ortaya koyarak bu bulguları güçlendirmektedir. GSYH büyümesinin gecikmeli etkileri büyük ölçüde önemsiz olsa da, kaliteli büyüme ile ilişkili birkaç gecikme katsayısı istatistiksel olarak anlamlıdır ve bu da büyüme kalitesindeki iyileşmelerin işgücü piyasası üzerinde daha kalıcı etkilere sahip olduğunu göstermektedir.

Asimetrik model, ilişkinin doğrusal olmayan doğasına ilişkin daha fazla bilgi sağlamaktadır. İşsizlik ile her iki büyüme ölçütü arasında uzun vadeli bir eşbütünleşme tespit edilmemesine rağmen, kısa vadeli dinamikler önemli asimetrlere ortaya koymaktadır. Özellikle, kaliteli büyümeye yönelik pozitif şoklar, negatif şokların neden olduğu işsizlik artışından daha büyük bir işsizlik azalmasına yol açmaktadır. Bu asimetri, yüksek kaliteli büyüme dönemlerinde işgücü piyasasının belirli bir direnç gösterdiğini işaret etmektedir. Buna karşılık, kişi başına düşen GSYH büyümesi daha zayıf ve büyük ölçüde simetrik kısa vadeli etkiler sergilemektedir. Genel olarak, bulgular Türkiye'de işsizliği azaltmada niceliksel büyümeden ziyade niteliksel büyümenin daha etkili olduğunu göstermektedir.