Hacettepe University Graduate School of Social Sciences

Department of Economics

EXAMINING THE RELATIONSHIP BETWEEN LABOR PRODUCTIVITY AND EMPLOYMENT LEVEL IN TURKEY: TRENDS AND IMPLICATIONS

Pınar TÜRK

Master's Thesis

Ankara, 2025

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ACCEPTANCE AND APPROVAL

The jury finds that Pınar TÜRK has on the date of 10/09/2025 successfully passed the defense examination and approves her Master's Thesis titled "Examining The Relationship Between Labor Productivity and Employment Level in Turkey: Trends and Implications".

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DEDICATION

To Hope, Innocence, and the Future

ABSTRACT

TÜRK, Pınar. *Examining The Relationship Between Labor Productivity and Employment Level in Turkey: Trends and Implications,* Master's Thesis, Ankara, 2025.

This thesis empirically examines the dynamic and long-term relationship between labor productivity and employment in Turkey from 1988 to 2023 by combining theoretical and methodological perspectives. The theoretical foundation is based on neoclassical growth theory, Keynesian and post-Keynesian demand-driven approaches, structural transformation, and technological change theory. The study is a component of a global discussion on whether growing productivity promotes inclusive employment or results in "jobless growth." Although automation and digitalization are not specifically modeled, the theoretical interpretation of the data covers their dual implications for labor markets. In order to investigate the impact of labor productivity (LP), inflation (I), gross fixed capital formation (GFCF), and the age dependency ratio (ADR) on employment, the ARDL bounds testing approach is utilized. The results are validated by robustness tests, and both short- and long-term associations are found. Labor productivity has a positive and statistically significant long-term influence on employment ($\beta = 0.2877$, $p < 0.001$), contrary to deterministic conceptions of productivity-induced labor displacement. Inflation has a modest positive short-run correlation with the Phillips curve, but ADR has a negative and substantial influence (-2.51, $p < 0.0001$), indicating demographic pressures. Without innovation and institutional reform, investment just is insufficient for the development of widespread jobs, as seen by the GFCF's apparent positive but negligible impact. The error correction term (ECT = -0.85, $p < 0.000$) indicates a quick adjustment process, with over 85% of disequilibria eliminated each year. Overall, the empirical findings show that productivity increase can coexist with job creation when supported by stable macroeconomic conditions and appropriate structural initiatives. In order to convert productivity improvements into long-term job growth, policy implications focus on improving labor market flexibility, encouraging sectoral diversification, encouraging human capital development, and maintaining macroeconomic stability.

Key Words

Labor Productivity, Employment-to-Population Ratio, Jobless Growth, ARDL Bounds Testing Approach, Turkey

ÖZET

TÜRK, Pınar. *Türkiye'de İş Gücü Verimliliği ve İstihdam Düzeyi İlişkisinin İncelenmesi: Trendler ve Çıkarımlar*, Yüksek Lisans Tezi, Ankara, 2025.

Bu tez, teorik ve metodolojik bakış açılarını birleştirerek 1988-2023 döneminde Türkiye'de işgücü verimliliği ile istihdam arasındaki dinamik ve uzun dönemli ilişkiyi ampirik olarak incelemektedir. Teorik temel; neoklasik büyüme teorisi, Keynesyen ve post-Keynesyen talep yönlü yaklaşımlar, yapısal dönüşüm ve teknolojik değişim teorisine dayanmaktadır. Bu çalışma, artan verimliliğin kapsayıcı istihdamı teşvik edip etmediği ya da 'istihdamsız büyümeye' yol açıp açmadığına ilişkin küresel tartışmanın bir parçasıdır. Otomasyon ve dijitalleşme doğrudan modele dâhil edilmemiş olsa da, verilerin teorik yorumu bunların işgücü piyasaları üzerindeki çift yönlü etkilerini kapsamaktadır. İşgücü verimliliği (LP), enflasyon (I), sabit sermaye yatırımları (GFCF) ve yaşa bağımlılık oranının (ADR) istihdam üzerindeki etkisini incelemek amacıyla ARDL sınır testi yaklaşımı kullanılmaktadır. Sonuçlar sağlamlık testleriyle doğrulanmış olup, hem kısa hem de uzun dönemli ilişkiler tespit edilmiştir. İşgücü verimliliği, istihdam üzerinde pozitif ve istatistiksel olarak anlamlı bir uzun dönem etkisine sahiptir ($\beta = 0.2877$, $p < 0.001$) ve bu durum, verimlilik kaynaklı işgücü ikamesine ilişkin deterministik yaklaşımların aksine bir bulgu ortaya koymaktadır. Enflasyon, Phillips eğrisiyle uyumlu olarak kısa dönemde ılımlı bir pozitif ilişki göstermekte; buna karşın yaşa bağımlılık oranı (ADR), demografik baskılara işaret eden negatif ve anlamlı bir etkiye sahiptir (-2.51, $p < 0.0001$). GFCF'nin pozitif ancak istatistiksel olarak önemsiz etkisinin de gösterdiği üzere, yenilikçilik ve kurumsal reformlar olmaksızın yatırımlar, geniş kapsamlı istihdam yaratımı için yetersiz kalmaktadır. Hata düzeltme terimi (ECT = -0.85, $p < 0.000$), hızlı bir uyum sürecine işaret etmekte olup, her yıl dengesizliklerin yüzde 85'inden fazlasının ortadan kaldırıldığını göstermektedir. Genel olarak, ampirik bulgular; istikrarlı makroekonomik koşullar ve uygun yapısal girişimlerle desteklendiğinde, verimlilik artışının istihdam yaratımıyla bir arada var olabileceğini göstermektedir. Verimlilik artışlarının uzun vadeli istihdam büyümesine dönüştürülebilmesi için politika önerileri; işgücü piyasası esnekliğinin artırılmasına, sektörel çeşitliliğin teşvik edilmesine, beşerî sermaye gelişiminin desteklenmesine ve makroekonomik istikrarın sürdürülmesine odaklanmaktadır.

Anahtar Kelimeler

İşgücü Verimliliği, İstihdam-Oranı, İstihdam Yaratmayan Büyüme, ARDL Sınır Testi Yaklaşımı, Türkiye

TABLE OF CONTENTS

ABBREVIATIONS

LP : Labor Productivity

EPR : Employment-to-Population Ratio

GFCF : Gross Fixed Capital Formation

ADR : Age Dependency Ratio

I : Inflation

ECT : Error Correction Term

ADF : Augmented Dickey-Fuller

PP : Phillips-Perron

ARDL : Autoregressive Distributed Lag

OLS : Ordinary Least Squares

CPI : Consumer Price Index

GDP : Gross Domestic Product

OECD : Organisation for Economic Co-operation and Development

WB : World Bank

TUIK : Turkish Statistical Institute

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The link between labor productivity and employment is still a major topic in economic theory and empirical research because of emphasizing the importance of productivity increase in enabling long-term economic growth, structural transformation, and social welfare. Economic development is known to be mostly driven by productivity increase (Solow, 1956; Kuznets, 1973; Syverson, 2011). It also defines a country's capacity to improve living standards and maintain its competitiveness in an increasingly globalized market (Solow, 1956; OECD, 2020). Essentially, one of the most significant indicators for evaluating the efficiency of production and resource utilization is labor productivity, which is measured as output per worker or output per hour worked. Nevertheless, employment may not necessarily benefit or expand linearly from increases in production. Concerns about job polarization, income inequality, and the potential for "jobless growth," in which total output rises but labor demand stagnates or declines, have been sparked by productivity gains in many nations .

It is particularly crucial to understand this relationship for developing countries like Turkey, which has seen substantial demographic and economic changes since the late 1980s. Turkey has seen periods of rapid growth interrupted by macroeconomic instability during the past three decades, including the global recession of 2008-2009, the financial crisis of 2001, and the currency crisis of 1994 (OECD, 2018; World Bank, 2020). These innovations have impacted labor market dynamics and productivity trends, resulting in a mixed picture of job growth and structural change. Since demographic variables affect labor force participation, savings, and the accumulation of human capital, the country's demographics—which include a rapidly aging population and shifting dependence ratios—further complicate the relationship between productivity and employment. Because of these considerations, a comprehensive, data-driven methodology is required to determine whether productivity gains in Turkey worsen labor market inequality or foster inclusive growth.

This research has strong theoretical roots in macroeconomic theory. The neoclassical growth model (Solow, 1956) states that productivity growth, which is fueled by capital deepening and technological innovation, fosters long-term increases in potential production and per capita income. According to this hypothesis, workers may be temporarily displaced by more productive workers, but as markets adjust, the

equilibrium employment levels will gradually rise. On the other hand, Keynesian and Post-Keynesian theories place a strong emphasis on the importance of aggregate demand and argue that productivity advances may lead to underemployment if there are no corresponding increases in demand for investments and consumption (Keynes, 1936; Kaldor, 1966). Structuralist perspectives, which emphasize sectoral dynamics, suggest that a common source of productivity growth in developing economies is labor reallocation between sectors, specifically the shift from low-productivity agriculture to higher-productivity manufacturing and services (McMillan & Rodrik, 2011). According to more recent studies, automation, digitization, and artificial intelligence are altering labor markets in two ways. These changes highlight the fact that technological improvements have the potential to both disrupt current enterprises and generate new job opportunities (Autor, 2014).

The results of empirical studies on the connection between employment and production have been mixed. International research indicates that the productivity growth of high-income countries has often been accompanied by stagnant or declining labor demand, particularly in manufacturing sectors (OECD, 2020). Although the impact of labor productivity on the employment level varies by sector, the increases in labor productivity are commonly positively associated with employment growth and Bassanini and Scorpetta (2001) observes that there is a positive relationship between productivity and employment growth in OECD countries. Developing economies, on the other hand, have displayed a range of patterns, with some employing productivity increases to create jobs and others dealing with structural unemployment and informal employment. Acemoglu and Restrepo (2019) state that automation technologies increase labor productivity but its effect on the employment level is complex. On the contrary, Rana and Sharma (2023) and Dave (2024**)** emphasizes the importance of AI on the increase of labor productivity because AI creates technology that boosts productivity and the impact of the employment level can deteriorate the economy of country. For example, China and India exhibits evidence of inappropriate AI use as technological unemployment happens.

Numerous studies have examined the complex relationship between productivity and employment in Turkey, revealing that productivity increases have frequently been concentrated in specific industries and have been accompanied by significant fluctuations in macroeconomic indicators (World Bank, 2020). Özer and Suna (2006)

emphasizes that vocational and technical education has an impact on the performance of employee and also contributes the labor productivity. Şentürk (2014) and Balkar (2022) emphasizes that the impact of education on the labor productivity is seen, clearly in the study and therefore, the increase of labor productivity affects employment level associate with education. Uzay (2006) highlights that there is a negative and significant but not strong relationship between labor productivity and employment growth in Turkey from 1961 to 2005.On the contrary, Özçelik (2020) highlight that labor productivity growth in Turkey mainly sources from within-sector growth that refers to producing more with the same amount of labor by using of new machines and innovative technologies and also this study observes that there isn't any relationship between labor productivity and employment level and it isn't seen any impact of labor productivity on the employment level. Few studies have used complete econometric frameworks to integrate demographic, macroeconomic, and structural variables over an extended period of time, despite the growing of the literature.

In order to close this gap, this thesis thoroughly analyzes Turkey's labor productivity and employment dynamics across the long and short terms, from 1988 to 2023. The Autoregressive Distributed Lag (ARDL) modeling framework (Pesaran et al., 2001) is used in the study to estimate cointegration relationships and error correction dynamics in a single specification. The methodology's strengths in handling variables of mixed integration orders (I (0) and I (1)) are also utilized. The age dependency ratio (ADR), inflation rate (I), and gross fixed capital formation (GFCF) are important control variables that are included into the econometric model to represent the combined impact of investment patterns, demographic pressures, and macroeconomic conditions on employment outcomes. This approach ensures that the relationship between productivity and employment in Turkey is thoroughly examined, accounting for both theoretical debates and policy-relevant concerns.

This research has three main conclusions to provide. Initially, it provides empirical evidence for the existence and resilience of Turkey's long-term equilibrium relationship between productivity and employment, enabling a thorough analysis of the "jobless growth" theory within the framework of an emerging economy. Second, the analysis combines demographic dynamics and investment factors to highlight the structural determinants of labor demand, furthering our understanding of the connection between productivity growth and capital creation. Third, this work uses sophisticated

econometric diagnostics, including stability assessments, error correction models, limits testing, and stationarity tests, to verify the robustness of the results. In the process, it contributes to the literature on productivity and labor markets and gives policymakers relevant data to promote inclusive growth and robust labor markets.

The rest of the thesis is organized as follows: Chapter 1 presents the conceptual and theoretical framework, which includes definitions and methods of measurement for labor productivity, and informs the concept of employment and also emphasizes the importance of relation between employment and productivity. In addition, the thesis reviews classical, Keynesian, and structuralist theories and uses empirical data based on Turkey in Chapter 2 and also provides a detailed analysis of the empirical findings, including robustness checks and diagnostic tests, and presents the dataset and econometric technique. Finally, this thesis reviews the findings, offers policy recommendations, and suggests some extensions for further research.

AIMS AND MOTIVATION OF THE THESIS

This thesis' primary goal is to examine the connection between Turkey's employment level and labor productivity from 1988 to 2023. Turkey, like many developing countries, has seen periods of economic growth without a matching rise in employment, a phenomenon known as "jobless growth," which serves as the inspiration for this study. This paradox calls into question how productivity affects labor market outcomes. Although productivity growth is typically seen as a catalyst for long-term economic growth, its impact on employment is more complex, as it can either generate or eliminate jobs based on the structural features of the economy.

There are three primary motivations for the theory. The first is the significance of labor productivity as a factor in long-term economic expansion. The second is that, even during times of great economic growth, Turkey continues to struggle with high unemployment and low labor force participation. Third, there aren't many comprehensive studies that co-examine employment and productivity patterns in Turkey. In order to inform policymakers and provide theoretical and empirical insights to the current literature, the study intends to address these concerns.

STRUCTURE AND CONTENT OF THE THESIS

In addition to the introduction, the thesis is divided into four major chapters. The conceptual and theoretical framework is developed in Chapter 1 after the introduction chapter, and the empirical analysis of the relationship between labor productivity and employment in Turkey is presented in Chapter 2. The key conclusions, policy implications, and recommendations for additional research are included at the conclusion of the thesis.

Chapter 1

The thesis's conceptual and theoretical foundations are established in Chapter 1. It starts by explaining what labor productivity is and going over the various ways to assess it, such as value-added, cost-based, and physical methods. After that, the idea of employment is presented, and then the rise in unemployment and its effects on the relationship between productivity and employment are discussed. The empirical study in subsequent chapters is based on the theoretical framework established in this chapter.

Chapter 2

The empirical study of Turkey's labor productivity and employment level is presented in Chapter 2. The theoretical frameworks that relate productivity to employment—such as sectoral dynamics, technological development, and neoclassical and Keynesian perspectives—are covered after giving a summary of the Turkish labor market. The next section is a review of the literature that consist of both international and Turkey. Next, with an emphasis on the ARDL limits testing strategy, the chapter presents the data and econometric methods. In-depth empirical results are provided, including stability tests, long- and short-term associations, diagnostic data, and unit root testing. The chapter ends with an interpretation of the findings in light of Turkey's economic structure and labor market.

CHAPTER 1
CONCEPTUAL FRAMEWORK AND THEORETICAL FOUNDATIONS

1.1. CONCEPT AND MEASUREMENT OF LABOR PRODUCTIVITY

1.1.1. The Concept of Labor Productivity

One of the primary economic indicators used to assess worker efficiency in the production process is labor productivity. It shows how much a worker produces over a specific time period (or per hour worked).. Labor productivity indicators are used to measure and demonstrate the efficiency and contribution level of the workforce.The following is formal labor productivity:

1. **Per Person Employed (Output per Worker):**

Labor Productivity = Real GDP / Number of Employed Individuals
(OECD, 2001; ILO, 2018)

2. **Per Hour Worked (Output per Hour):**

Labor Productivity = Real GDP / Total Hours Worked
(OECD, 2001; Schreyer, 2001)

Understanding the effectiveness and performance of an economy's workforce requires measuring labor productivity. It is a crucial indicator of economic growth, competitiveness, and living standards since it shows how well labor inputs are converted into economic outputs (OECD, 2001). Increased productivity supports sustainable economic growth and income increases by allowing an economy to generate more goods and services without increasing labor inputs (Schreyer, 2001).

Measuring labor productivity also enables policymakers with important insights into resource allocation, wage dynamics, and employment strategies It helps in assessing how capital expenditures, education programs, and technology developments affect economic performance (ILO, 2018). Furthermore, comparing productivity levels between nations or industries allows for a recognition of competitive advantages and structural weaknesses, which informs investment strategies and targeted reforms (World Bank, 2023).

To guarantee precision, applicability, and comparability, a labor productivity assessment system should have a number of essential components. First and foremost, it needs to be based on trustworthy and consistent data sources that enable productivity calculations across sectors and throughout time (OECD, 2001). Second, the amount and quality of labor inputs, such as hours worked, skill levels, and educational attainment, should be taken into consideration by the measurement framework (ILO, 2018). Third, the system ought to offer de-identified data to enable sectoral and regional analysis, enabling academics and policymakers to pinpoint areas for improvement and productivity disparities (Schreyer, 2001).

Finally, it is critical for assessing a country's performance in the global economy in order to allow meaningful international comparisons and thus labor productivity measurement must be transparent, meaning that definitions, data sources, and calculation methods are clearly explained, and open, meaning that both the methodology and the resulting data are accessible to all relevant stakeholders (World Bank, 2023).

1.1.2. Measurement of Labor Productivity

A popular definition of labor productivity is the quantity of output generated per unit of labor input, which can be expressed in terms of the number of employees or the number of hours worked.

OECD (2023) states that the standard method for calculating labor productivity is to divide the Real Gross Domestic Product (GDP) by the total number of hours worked by all employed individuals. By controlling for inflation, this metric makes it possible to evaluate how effectively labor inputs are converted into economic output. The formula for labor productivity that is most frequently employed is:

Labor Productivity = Real GDP / Total Labor Input

where, depending on the quality and accessibility of labor market data, "Total Labor Input" may refer to either total employment or total hours worked (ILO, 2020).

GDP per hour worked is frequently regarded as a more accurate indication since it takes into account variances in working time, even while GDP per employed person offers a broad measure of productivity across the economy (OECD, 2023). Consistent and comparable data on output and labor inputs across time and sectors are essential for measuring productivity, according to international agencies like the World Bank and the International Labor Organization (ILO) (ILO, 2018; World Bank, 2021). The measurement method used in empirical research can affect how productivity trends are interpreted and how they affect employment, wages, and economic growth.

1.1.2.1. Physical Measurement

The amount of goods and services produced per unit of labor input can also be used to quantify labor productivity in terms of physical quantities rather than monetary values. This method works best in industries like mining, manufacturing, and agriculture where outputs are consistent and easy to count (OECD, 2001).

Productivity in these situations is frequently stated as the quantity of tangible units produced per employee or per hour of labor. The number of units constructed per production line worker in manufacturing or the kilograms of wheat harvested per agricultural worker in agriculture are two examples of how it could be quantified. Monetary-based productivity indices may be impacted by inflation and price fluctuations, but the physical measuring approach avoids these distortions (Syverson, 2011).

However, it is less appropriate for industries where standardizing physical units is difficult, such services, or when outputs are extremely varied or intangible (ILO, 2020). Furthermore, advances in quality or technological sophistication that are reflected in monetary metrics could not be captured by physical measures. In order to maintain comparability between sectors and nations, monetary measurements for macroeconomic analysis are frequently employed in conjunction with physical productivity indicators, which are widely utilized for operational management and benchmarking within industries (OECD, 2001; ILO, 2020).

1.1.2.2. Cost-Based Measurement

Cost-based labor productivity measurement compares the output to the labor expenditures that were incurred during production. With this method, productivity is expressed as the ratio of output value (in monetary terms) to total labor compensation, which includes pay, benefits, and other employment-related expenses, rather than as the amount of physical output per worker or per hour. According to the OECD (2001), cost-based measuring technique is a better way to evaluate labor productivity when comparing industries that produce different commodities and services or when physical output data is not available.With this approach, the formula can be written as follows:

Labor Productivity (Cost-Based) = Value of Output / Labor Cost

In this case, the value of output is frequently expressed as gross value added (GVA) at constant prices, whereas labor costs are the sum of all employee compensation, including direct and indirect compensation (ILO, 2018). Policymakers and businesses can assess how well labor costs convert into economic value using this indicator. One benefit of cost-based measurement is that it may be used in non-manufacturing industries like services, where it might be challenging to specify physical quantities.

Its potential to reflect wage fluctuations rather than actual changes in productivity is a major drawback, though; for example, a wage cut without corresponding changes in output could artificially boost assessed productivity (Jorgenson & Griliches, 1967). In order to get a more comprehensive view of productivity performance, analysts frequently combine cost-based statistics with physical or hours-worked-based indicators.

1.1.2.3. Added-Value Based Measurement

Labor productivity is measured using the added-value-based measurement approach, which links the value added produced by an economic unit to the labor input used. Value added is the difference between total production and intermediate consumption, which is the net output of products and services produced (OECD, 2001). Labor's role in generating additional value during the production process is the main emphasis of this metric. One way to express the generic formula is:

Labor Productivity (Value-Added Based) = Value Added / Labor Input

In this case, labor input might be expressed as the total number of hours worked or the number of employed individuals (ILO, 2018). In order to exclude the impact of inflation and enable more precise comparisons over time, value added is usually computed at constant prices. Particularly when examining sectoral performance or cross-country comparisons, this approach is frequently employed in national accounts and productivity statistics (OECD, 2001).

The ability of the value-added approach to eliminate the effect of intermediary items by accounting for labor efficiency in producing net economic output rather than gross production is one of its primary advantages. Nevertheless, it has drawbacks as well, like the need for precise input and output valuation, which can differ between statistical systems and businesses.

1.2. EMPLOYMENT CONCEPT AND JOBLESS GROWTH

1.2.1. The Concept of Employment

Employment is a basic economic and social notion that describes the situation when people work productively for compensation, such as wages, salaries, or income from self-employment. According to ILO (2013) employment includes all individuals of working age who were involved in any activity that involved producing goods or providing services for compensation or profit during a certain reference period. Paid employment and self-employment are included in this definition, as are both formal and informal work arrangements.

One important measure of social well-being, labor market conditions, and economic success is employment (OECD, 2021). It is strongly related to productivity, income distribution, and poverty alleviation, and it represents an economy's ability to create employment possibilities for its people. Employment has a positive impact on social integration, personal growth, and general quality of life in addition to its economic function (Standing, 1999).

According to statistical evidence, employment is most commonly measured through labor force surveys, establishment surveys, and administrative records. Full-time and part-time employment, as well as formal and informal employment, are frequently distinguished (ILO, 2018). Employment is a key variable in macroeconomic analysis that is used to evaluate unemployment rates, labor market dynamics, and the connection between labor supply and economic growth.

1.2.2. Jobless Growth and Productivity–Employment Nexus

The concept of jobless growth refers to an economic phenomenon in which a country or region experiences sustained growth in output, measured by real gross domestic product (GDP), without a commensurate increase in employment levels. In some cases, employment growth stagnates or even declines, despite persistent increases in productivity and aggregate output. This paradoxical outcome challenges traditional macroeconomic theory, which historically assumed that higher economic growth would be accompanied by proportionate job creation (Okun, 1962). The emergence of jobless growth has been a subject of considerable interest in both developed and developing economies, particularly in contexts where structural transformation, technological advancement, or policy choices have altered the employment elasticity of growth (Kapsos, 2005).

The relationship between **productivity and employment** lies at the core of the jobless growth debate. Classical growth theory and early Keynesian perspectives assumed that improvements in labor productivity would, over time, translate into higher incomes, increased demand, and greater employment opportunities. However, the post-industrial shift towards knowledge-intensive sectors, automation, and capital-deepening has led to a weakening of this link. High-productivity growth can displace labor in certain industries, especially where technological substitution of routine tasks is prevalent, while employment gains tend to concentrate in service sectors characterized by lower productivity growth (Baumol, 1967). This structural imbalance creates the conditions for aggregate growth without broad-based job creation.

In emerging market economies such as Turkey, jobless growth has been observed during periods of rapid structural change. Episodes of economic expansion, often driven by productivity gains in manufacturing or capital-intensive sectors, have not

always translated into equivalent employment growth. Several factors contribute to this phenomenon:

1. **Capital-Intensive Growth Strategies:** Policies favoring physical capital accumulation and export-oriented industrialization may enhance productivity but reduce labor demand elasticity. (Kapsos, 2005).
2. **Labor Market Rigidities:** Institutional and regulatory frameworks can inhibit labor absorption, amplifying the disconnect between GDP growth and employment.
3. **Technological Change and Globalization:** Integration into global value chains often encourages specialization in high-productivity sectors while limiting labor absorption. (UNCTAD, 2013; Brynjolfsson & McAfee, 2014).
4. **Demographic Dynamics:** A rising working-age population places additional pressure on labor markets, meaning growth must be substantially higher to absorb new entrants. (Bloom & Canning, 2004).

The **productivity–employment nexus** thus represents a complex interplay between supply-side factors (capital deepening, technological advancement, labor market efficiency) and demand-side dynamics (aggregate demand, wage growth, consumption patterns). Empirical studies show that employment elasticity with respect to GDP growth has declined in many developing economies since the 1990s, suggesting a structural rather than cyclical phenomenon. For policymakers, this implies that productivity growth alone is insufficient to achieve inclusive growth; active labor market policies, skills development programs, and sectoral diversification strategies are necessary to translate economic expansion into meaningful employment opportunities. (World Bank, 2013; ILO, 2010; OECD, 2018).

In the context of Turkey, understanding this nexus is particularly important, given the country's economic volatility and sectoral shifts over the past three decades. Periods of strong GDP growth—particularly in the early 2000s—were not always associated with proportionate increases in employment, underscoring the relevance of structural reforms, investment in human capital, and the quality of growth. This thesis' focus on the interaction between labor productivity, gross fixed capital formation, demographic factors, and inflation provides a framework for examining whether growth patterns in Turkey have exhibited jobless characteristics, and to what extent policy interventions can strengthen the link between productivity gains and employment creation.

CHAPTER 2
THE RELATIONSHIP BETWEEN LABOR PRODUCTIVITY AND EMPLOYMENT LEVEL IN TURKEY

Macroeconomic growth theory, labor economics, and development studies all focus heavily on the relationship between labor productivity and employment levels. Although productivity increase is frequently regarded as a sign of economic efficiency, competitiveness, and technical innovation, its effects on labor market outcomes are not always clear-cut. In contrast to Keynesian viewpoints, which stress aggregate demand circumstances as facilitators of employment creation, the classical and neoclassical growth paradigms usually assume that productivity advances raise real wages and labor demand over time. The significance of sectoral changes, capital accumulation, and technical advancement is also emphasized by modern growth theory; these factors all have different effects on labor absorption (Baumol, 1967; Okun, 1962). The necessity for country-specific empirical analysis is highlighted by this complexity, especially in emerging market countries like Turkey where cyclical instability, demographic pressures, and structural changes coexist.

The trend of Turkey's economic development over the last three decades presents a strong case for considering this relationship. In addition to periods of substantial financial and economic crises—most notably the 1994 currency crisis, the 2001 banking and financial crisis, and the 2008-2009 global financial downturn—the nation has also seen periods of high GDP expansion mixed with periods of post-crisis recovery. Changes in labor participation rates, productivity patterns, and employment structure have been associated with each of these periods, indicating both structural and cyclical dynamics (OECD, 2023; World Bank, 2023). Despite significant increases in productivity and overall output, employment growth has been slow for a number of years, a phenomenon known as "jobless growth" by academics, which occurs when output growth is separated from significant labor absorption. This phenomena has raised questions about the sustainability and inclusivity of Turkey's growth, especially in light of the country's continued informality, diverse population, and varying production levels across sectors.

There are significant practical implications in addition to the theoretical interest in the relationship between productivity and employment. Developing labor market regulations, investment plans, and social safety net programs that guarantee economic expansion results in higher living standards and more job opportunities requires an understanding of this relationship. In the Turkish context, the productivity-employment dynamic is further complicated by structural elements like gender gaps in participation, regional development disparities, a division in the labor market (formal-informal segmentation), and skill mismatches. Furthermore, the employment elasticity of output growth has decreased due to capital-intensive growth patterns, particularly in manufacturing, which have been facilitated by increasing globalization and Turkey's incorporation into global value chains (ILO, 2022).

In order to give a thorough and empirically sound examination of the relationship between productivity and employment in Turkey, this chapter will concentrate on identifying both short-term and long-term trends. The chapter's main econometric technique is the Autoregressive Distributed Lag (ARDL) bounds testing approach, which is based on annual macroeconomic data for the years 1988–2023. For this analysis, the ARDL model is especially useful because it allows for the joint estimation of short- and long-term dynamics, supports regressors with different orders of integration (I(0) and I(1)), and guarantees reliable statistical inference even in situations with small samples (Pesaran et al., 2001). Using this methodology, this chapter investigates cointegration relationships among variables and providing more insights into the stability and persistence of these interactions over time.

The objective of the empirical model is to accurately represent many aspects of the economy. The employment-to-population ratio (EPR) and labor productivity (GDP per hour worked) are two of the model's many macroeconomic variables, which represent supply-side and demand-side dynamics.

In model, other variables consist of:

- **Gross Fixed Capital Formation (GFCF)**, representing capital accumulation and investment intensity;
- **Age Dependency Ratio (ADR)(for old)**, reflecting demographic pressures and the working-age population burden; and

- **Inflation (I)**, indicating macroeconomic stability and its indirect influence on labor markets.

Extensive empirical research demonstrates that employment performance is influenced by several factors in addition to productivity, which is why these variables were included in the analysis. (ILO, 2020) This chapter aims to reveal the complex ways that productivity gains interact with investment, demographics, and macroeconomic conditions to influence employment outcomes in Turkey by utilizing a structural model that incorporates these variables.

Methodologically, the chapter uses a stepwise econometric approach, starting with descriptive analyses of variables and then unit root testing with the Augmented Dickey-Fuller and Philips Perron tests. This guarantees that before moving on to the ARDL bounds testing framework, stationarity properties are fully comprehended. In addition to cumulative sum (CUSUM) and CUSUMSQ stability checks, diagnostic tests such as the Breusch-Godfrey serial correlation LM test, Breusch-Pagan-Godfrey heteroskedasticity test, and Ramsey RESET specification test are used to evaluate the model's stability. When considered as a whole, these steps enables the validity and robustness of the estimated relationships, reducing worries about inaccurate regression findings or incorrect model specification.

This chapter makes two empirical contributions to the existing research. First, it offers current data on the relationship between productivity and employment in Turkey over an extended period of time that comprises several structural disruption and economic shocks. Second, it provides insights that are relevant to policy by measuring productivity and determining how investment, inflation, and demography influence employment dynamics. This data is especially important for policymakers who want to create inclusive growth plans that guarantee productivity increases result in better labor market outcomes.

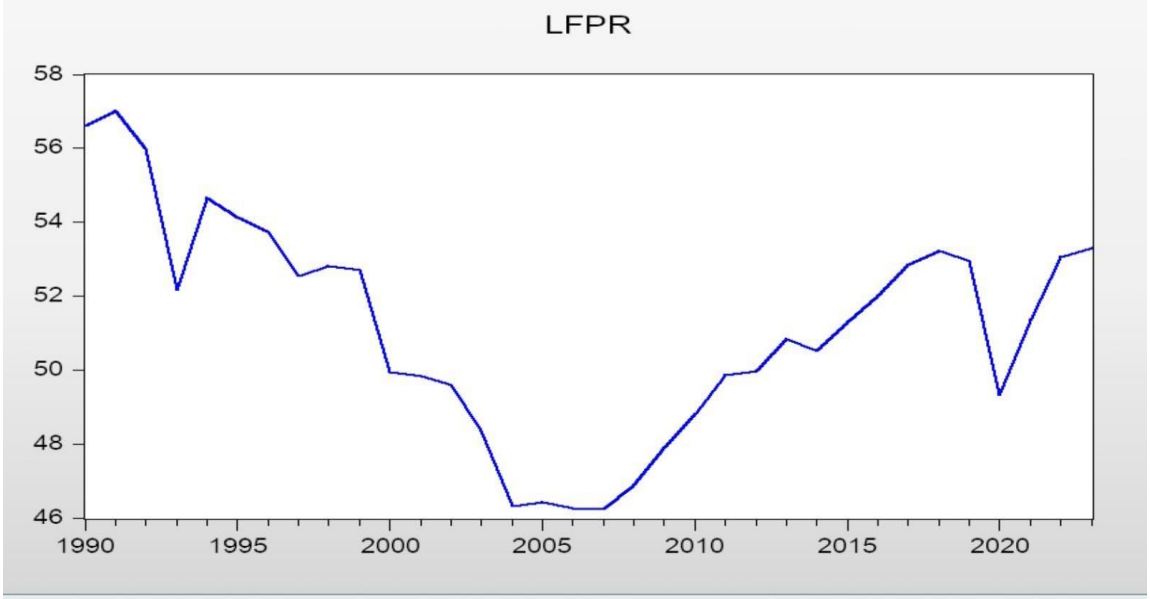
The chapter is divided into the following sections: A thorough summary of Turkey's labor market trends, including participation rates, sectoral employment changes, and productivity trends, is provided in Section 2.1. In addition to discussing technological change and automation, Section 2.2. examines theoretical approaches to the productivity-employment relationship, including neoclassical, Keynesian, and

structuralist viewpoints. A thorough evaluation of the literature, including both foreign research and evidence unique to Turkey, is provided in Section 2.3. The dataset and analytical framework are described in Section 2.4, and empirical results and robustness tests are reported in Section 2.5. Section 2.6, which summarizes the findings and emphasizes their implications for labor market and growth policy, brings the chapter to a close.

2.1. OVERVIEW OF LABOR MARKETS IN TURKEY

This section highlights the structural characteristics and long-term changes of Turkey's labor market from 1990 to 2023. It starts by investigating the dynamics of overall labor force participation rates (LFPR) and then compares gender-specific patterns using male and female participation rates (MLFPR and FLFPR). In the next section, the trends in Turkey's youth and overall unemployment rates are examined, and then the unemployment rates for men and women are evaluated to show how gender affects labor market outcomes. Since informal and self-employment rates are crucial indicators of job quality and labor market segmentation, the section subsequently looks at trends in these rates. In the final section, the analysis looks at the sectoral distribution of total employment from 2005 to 2023, as well as the sectoral distribution of male and female employment, to understand the structural composition and transformation of the Turkish labor market. Overall, this section intends to provide a complete review of the significant events and ongoing problems that have shaped Turkey's labor market during the last three decades.

Figure 1: Trends in Labor Force Participation Rates in Turkey (1990–2023)



Source: Author's calculations based on World Bank (2025) data accessed via TradingEconomics.com

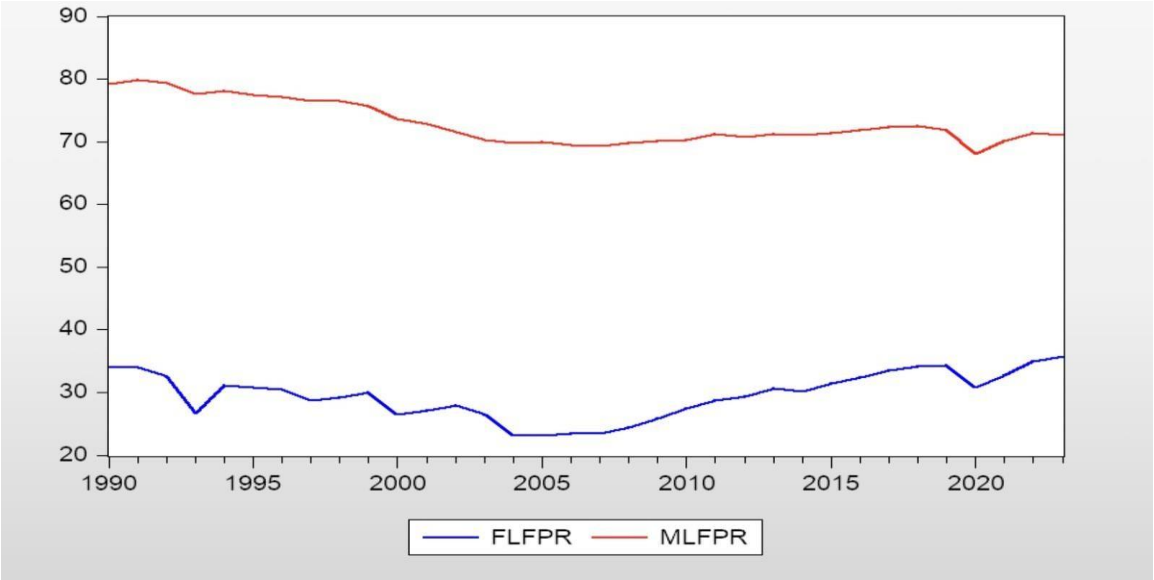
The change in Turkey's labor force participation rate (LFPR) between 1990 and 2023 is depicted in Figure 1. The trend shows a significant drop over the 1990s and the first part of the 2000s, with the lowest level occurring about 2005. This negative trend is most likely due to structural transformations in the Turkish economy, such as the transition from agriculture to industry and services, demographic changes, and women's relatively low labor-force participation throughout this time period.

Beginning in the mid-2000s, the LFPR shows a significant increasing trend, indicating a progressive increase in labor market participation. This growth could be attributed to a number of things, including changes in the population, educational attainment, and the adoption of strong labor market policies meant to boost work opportunities, especially for women and younger generations.

The dramatic decrease seen around 2020 is due to the COVID-19 epidemic, which temporarily hampered labor market activity. Nonetheless, the subsequent recovery highlights the Turkish labor market's resilience, as participation rates rapidly increased in the years that followed.

Overall, the long-term pattern shows a U-shaped trend, with a large contraction in the 1990s and early 2000s, followed by a steady recovery over the last decade. This trend offers crucial background information for understanding the demographic and structural factors influencing Turkey's labor supply and job performance.

Figure 2: Trends in Male and Female Labor Force Participation Rates in Turkey (1990–2023)



Source: Author's calculations based on World Bank (2025) data accessed via TradingEconomics.com

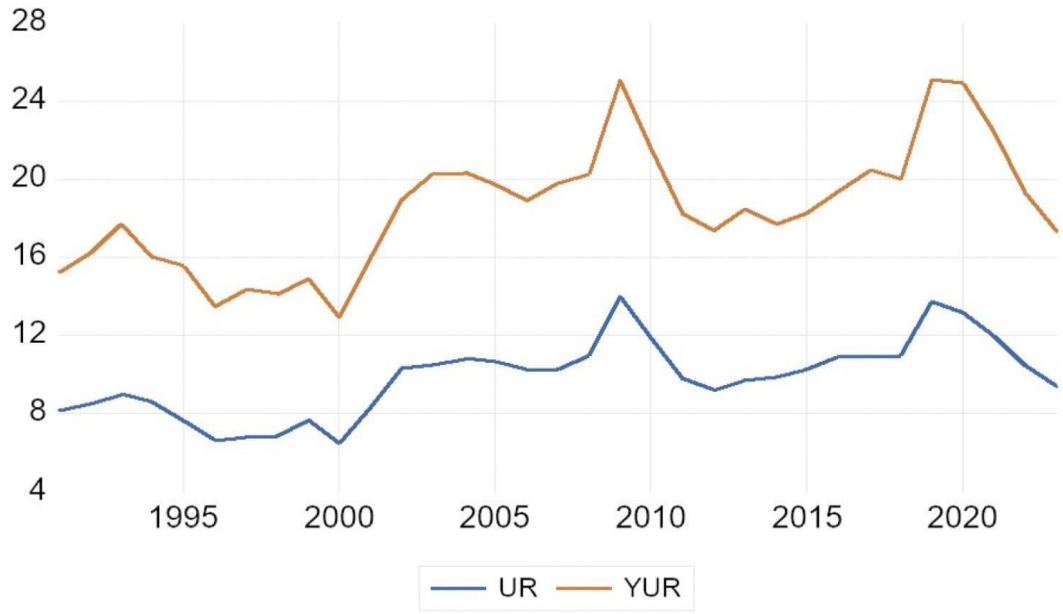
Figure 2 shows the change of male (MLFPR) and female (FLFPR) labor force participation rates in Turkey from 1990 to 2023. The data show a continuous gender difference in labor market involvement, with male rates consistently surpassing 70% and female rates being below 35% throughout the period. Female participation significantly decreased in the 1990s and early 2000s, which was a result of structural change, rural-to-urban migration, and a lack of job possibilities for women outside of agriculture. The lowest level was recorded about 2005.

However, female involvement has been steadily increasing since the mid-2000s, indicating a slow but consistent advancement in gender inclusion in the workforce. Demographic shifts, regulatory initiatives supporting female employment, and growing educational attainment among women could all be contributing factors to this

development. Although these advancements, the gender gap remains large, highlighting the structural and cultural impediments to equal participation.

On the contrary, male participation rates have been mostly stable but slightly dropping over time, with modest fluctuations surrounding economic shocks such as the 2008 global financial crisis and the 2020 COVID-19 pandemic. These trends point out the need for ongoing policy emphasis on gender equality and labor market integration in order to achieve inclusive growth.

Figure 3: Trends in Total and Youth Unemployment Rates in Turkey (1990–2023)



Source: Author's calculations based on World Bank (2025) data accessed via TradingEconomics.com

Figure 3 depicts the change of Turkey's overall unemployment rate (UR) and youth unemployment rate (YUR) from 1990 and 2023. The statistics show that both variables have seen cyclical fluctuations that are closely related to macroeconomic changes, structural transformations, and external shocks to the Turkish economy.

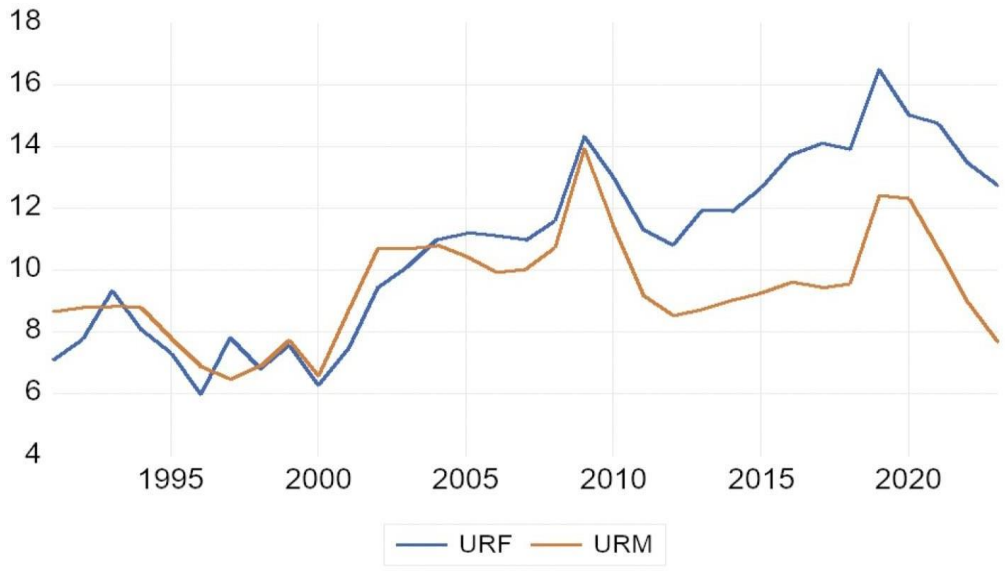
Throughout the 1990s, unemployment remained relatively low, but persistent structural rigidities and demographic pressures limited labor absorption. The early 2000s saw a

considerable jump in both UR and YUR, corresponding with the 2001 financial crisis, which had a significant impact on the youth section of the labor force.

The time period following 2005 indicates a pattern of stabilization, although unemployment rates remain higher than in previous decades. The global financial crisis of 2008-2009 resulted in a temporary increase in unemployment, particularly among young people, indicating their higher sensitivity to economic downturns. As well, a high increase around 2020 corresponds to the COVID-19 epidemic, which disrupted labor demand and disproportionately impacted younger people in temporary or informal jobs.

Though there has been a modest recovery since the pandemic, youth unemployment has always remained significantly higher than the overall rate, emphasizing structural mismatches between schooling and labor market requirements, as well as inadequate prospects for labor market entry. This continuing gap underlines the need for targeted youth employment policies and skill-development initiatives that promote inclusive labor market participation.

Figure 4: Trends in Male and Female Unemployment Rates in Turkey (1990–2023)



Source: Author's calculations based on World Bank (2025) data accessed via TradingEconomics.com

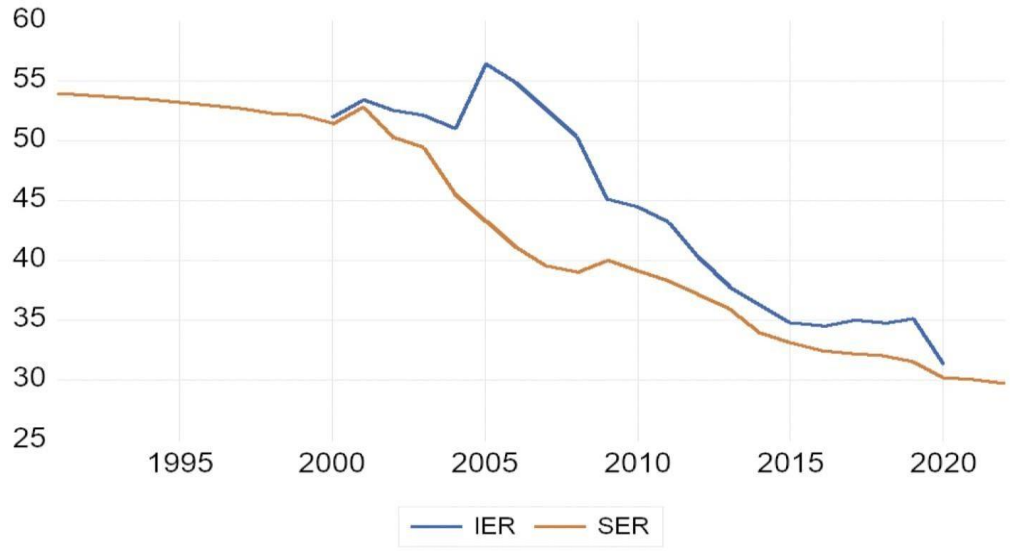
The change in Turkey's unemployment rates for women (URF) and men (URM) from 1990 to 2023 is depicted in Figure 4. The overall trend shows that there are still gender differences in unemployment, with female rates often higher than male rates for the most of the time.

During the 1990s, unemployment rates for both genders were quite close, ranging between 7-9%. A more noticeable difference, however, became apparent in the early 2000s when female unemployment increased more significantly during times of economic instability, especially after the financial crisis of 2001. This difference reflects systemic obstacles that women confront, such as limited access to formal employment, sectoral segregation, and difficulties in balancing work and home duties.

The 2008-2009 global financial crisis and the 2020 COVID-19 pandemic significantly increased female unemployment, with women more likely to work in vulnerable areas such as services and informal activities. However, due to men's greater representation in formal employment and industry, male unemployment showed a more consistent trend with smaller volatility.

Female unemployment has been consistently higher, despite some convergence during economic expansion periods, suggesting that gender disparities in labor market results continue. This trend emphasizes the necessity of focused legislative measures to advance women's integration into the workforce, lessen informality, and improve gender parity in the workplace.

Figure 5: Trends in Informal and Self-Employment Rates in Turkey (1990–2023)



Source: Author's calculations based on ILO (2024) and World Bank (2025) data accessed via TradingEconomics.com

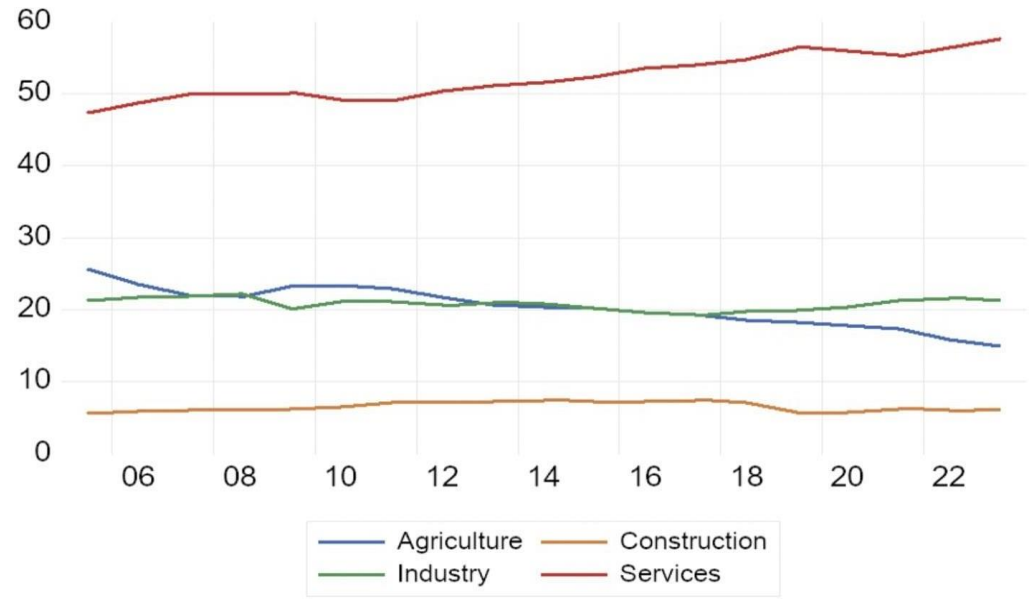
The long-term trends in self-employment (SER) and informal employment (IER) in Turkey from 1990 to 2023 are depicted in Figure 5. As a result of structural changes in the Turkish labor market and the slow transition from informal and agricultural work to more formal, wage-based employment, both indices show a sharp and consistent fall across the studied period.

A labor market that was mostly dependent on traditional sectors and unregistered work was indicated by the comparatively high rates of informal and self-employment in the early 1990s—roughly or above 50%. However, during the early 2000s, both rates have fallen, particularly after 2005, corresponding with significant economic restructuring, urbanization, and labor market regulation. The fall in self-employment corresponds to the declining role of agricultural labor and the growth of wage employment in services and industry.

Although these improvements, the continuance of relatively significant informal employment—particularly in low-skilled and service-oriented occupations—indicates that full formalization will continue to be difficult to achieve. Nevertheless, informality in the Turkish labor market is sustained by structural factors such regional differences, a lack of enforcement power, and the predominance of small businesses.

The high fall in 2020 reflects the temporary interruptions caused by the COVID-19 epidemic, which disproportionately affected informal and self-employed individuals without job security or social protection. In general, the downward trend in both IER and SER highlights Turkey's slow shift to a more structured and contemporary work environment.

Figure 6: Sectoral Distribution of Total Employment in Turkey (2005–2023)



Source: Author's calculations based on Turkish Statistical Institute (TurkStat) (2024) data

The changes in employment shares throughout the years 2005-2023 in the four main sectors—agriculture, industry, construction, and services—are shown in Figure 6. The figures clearly show Turkey's continuous structural change, which is marked by a move away from agriculture and toward services and, to a lesser degree, industrial activity.

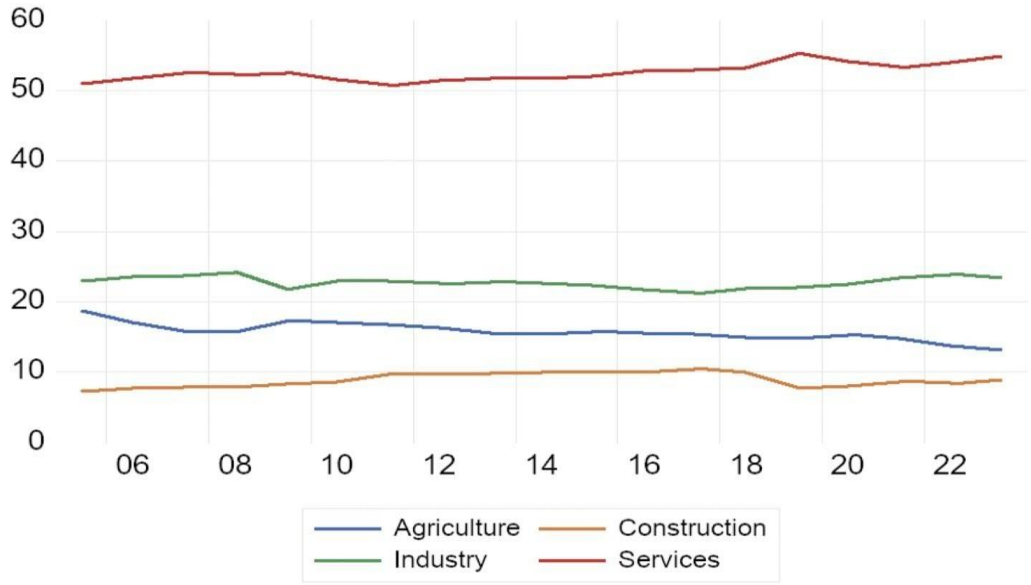
At the start of the period, the agricultural sector comprised a significant percentage of total employment (about 25%), but its share has rapidly dropped to less than 15% by 2023. This shrinkage reflects a larger trend of urbanization, mechanization, and worker reallocation from low-productivity agricultural activities to non-agricultural sectors.

Conversely, the services sector has grown steadily, increasing from slightly more than 45% in 2005 to roughly 55-60% in recent years. This increase demonstrates the growing importance of services in Turkey's economy, which is being driven by the expansion of trade, tourism, finance, education, and public services.

About 20% of the economy has been in the industrial sector, which indicates moderate but steady industrial employment. Furthermore, construction employment has fluctuated little, expanding modestly during periods of economic boom (particularly after 2010) and reducing following cyclical downturns and policy adjustments.

In general, the graph depicts Turkey's progressive shift to a service-based employment structure, with diminishing agricultural employment and stable industrial and construction percentages. A shift toward a more urbanized and diverse economy is shown by this sectoral reallocation, which has significant effects on productivity, employment quality, and regional labor market dynamics.

Figure 7: Sectoral Composition of Male Employment in Turkey (2005–2023)



Source: Author’s calculations based on Turkish Statistical Institute (TurkStat) (2024) data

Figure 7 displays the sectoral composition of male employment in Turkey from 2005 to 2023. The data show that male employment is mostly centered in the services sector, which has progressively expanded its share from approximately 50% in the mid-2000s to over 55% by 2023. This increase shows the growing importance of services in the Turkish economy, which includes operations such as trade, transportation, governmental administration, and personal services.

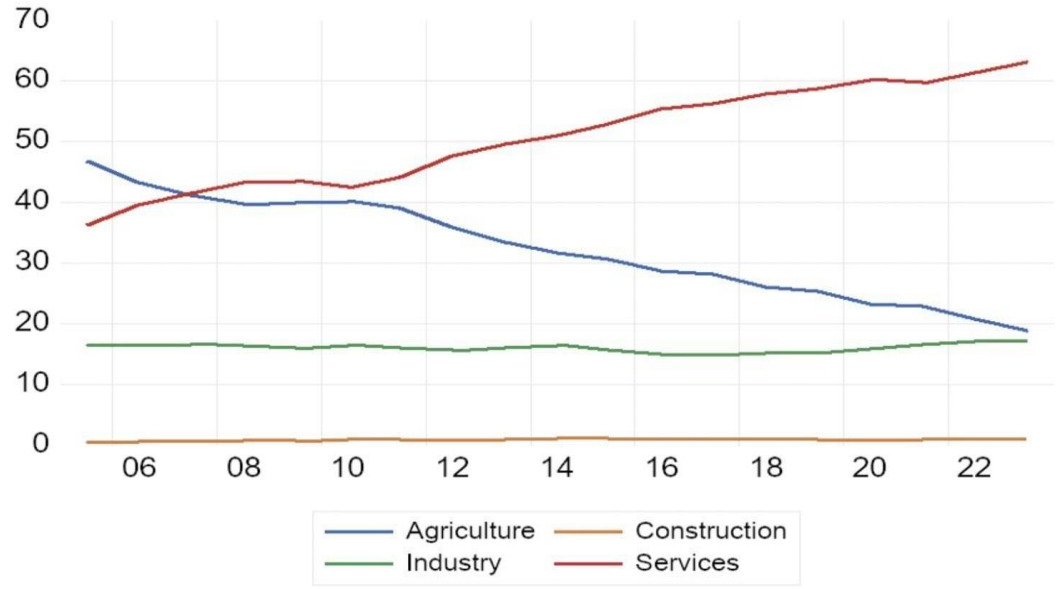
Throughout the period, the industrial sector has consistently accounted for the second biggest proportion of male employment, maintaining about 22-24%. This stability indicates that manufacturing and industrial production will continue to be important sources of male employment, especially in urban and semi-urban areas.

Conversely, the agricultural sector has gradually declined, falling from about 18% in 2005 to less than 13% by 2023. This negative trend reflects the reduction in the demand for male labor in agriculture brought about by structural change, rural-to-urban migration, and agricultural production mechanization.

The construction sector, however comparably smaller, exhibits a modest rising trend until about 2017, followed by slight changes thereafter. This trend illustrates how construction activity in Turkey is cyclical and strongly correlated with periods of economic expansion, housing demand, and investment in public infrastructure.

On the whole, the graph highlights Turkey's shift to a service- and industry-oriented employment structure among men, with a diminishing dependence on agriculture and a moderate but resilient role for construction. These dynamics emphasize the Turkish labor market's overall structural development, as well as the changing sectoral demand for male labor.

Figure 8: Sectoral Distribution of Female Employment in Turkey (2005–2023)



Source: Author's calculations based on Turkish Statistical Institute (TurkStat) (2024) data

The change in female employment in Turkey's main industries—agriculture, construction, and services—between 2005 and 2023 is depicted in Figure 8. The data show a significant structural shift from agriculture to services, reflecting both economic development and shifting patterns of female labor force involvement.

Nearly half of all female occupations at the start of the period came from the agricultural sector, which was the primary type of work for women. Nevertheless this percentage has continuously fallen over time, with a projected drop to less than 20% by 2023. This sharp decrease underlines the continuous rural-to-urban migration, mechanization of agricultural production, and the diminishing importance of subsistence farming, where female labor has traditionally played a significant role.

The services industry, on the other hand, has grown remarkably and steadily, going from about 35-40% in 2005 to over 60% by 2023. This increase reflects the increasing number of women in service-oriented jobs such as education, health care, retail commerce, public administration, and personal services, which provide more formal and stable work options.

Because of the restricted integration of women into manufacturing and production activities, the industrial sector has maintained a very small but consistent share (about 15%). Furthermore, female employment in construction has been essentially negligible throughout the time, reflecting both gender division and conventional labor standards in Turkey's labor market.

The overall trend shows a clear structural reallocation of female employment from low-productivity agricultural jobs to urban, service-based jobs. Although issues with occupational segregation and access to good jobs still exist, this change is consistent with larger trends of economic modernization and women's rising educational achievement.

Turkey's labor market has unique structural features that affect the connection between employment and labor productivity. Urbanization, industrial diversification, and more integration into international markets are some of the hallmarks of Turkey's dramatic economic transition during the last 20 years (OECD, 2021). Alongside these developments, sectoral job patterns have changed, with the service sector growing and agriculture employment declining.

Turkey's labor productivity has increased since the early 2000s, mostly due to structural reforms, capital investment, and the adoption of new technologies (World Bank, 2020). Industries focused on manufacturing and exports have outperformed agriculture and several low-value service sectors, indicating that productivity development has been unequal across sectors. Wage inequality and the distribution of jobs are impacted by this uneven productivity development.

Another feature of the Turkish labor market is the comparatively large percentage of informal work, which in 2020 made up over one-third of all jobs (TurkStat, 2021). Reduced productivity and restricted access to social security, training, and labor rights are frequently associated with informality, which can make it more difficult to convert productivity increases into long-term job growth.

A young and expanding working-age population is one of the demographic aspects that offer Turkey's labor market with both opportunities and challenges. Although this demographic trend can help with economic growth and the labor supply, it also

necessitates long-term job creation and productivity gains in order to integrate new workers into the workforce.

All things considered, Turkey's labor market exhibits a dynamic interaction between sectoral changes, labor market institutions, and productivity increases. Designing policies that promote equitable growth and balanced employment outcomes requires an understanding of these processes.

2.2. THEORETICAL APPROACHES TO THE LABOR PRODUCTIVITY-EMPLOYMENT RELATIONSHIP

Many schools of thought have provided differing explanations for the nature and dynamics of the relationship between labor productivity and employment, which has been a major focus of labor economics and macroeconomic theory. A major factor in determining economic growth, competitiveness, and living standards is labor productivity, which is often defined as output per unit of labor input (OECD, 2020). In turn, employment levels have an impact on social welfare, income distribution, and aggregate demand. Both supply-side and demand-side viewpoints can be used to examine the theoretical relationship between these two variables.

According to Keynes, increased labor productivity can result in increased output and incomes, but it can also cause technological unemployment if productivity improvements are not accompanied by corresponding increases in aggregate demand (Keynes, 1936). According to this viewpoint, wage policies and public investment can assist strike a balance between job creation and productivity growth, emphasizing the need of effective demand in maintaining employment.

On the other hand, the neoclassical paradigm places more emphasis on the importance of flexible labor markets and market-clearing salaries. This perspective holds that, under the assumption of competitive labor markets and steady returns to scale, greater productivity raises the marginal product of labor, which in turn raises real wages and maybe creates additional jobs (Solow, 1956). Nevertheless, if productivity increase is labor-saving, it can raise labor demand in some industries while decreasing it in others, depending on income and substitution effects.

The structuralist and post-Keynesian methods emphasize income inequality, institutional problems, and the possibility of a misalignment between job growth and productivity improvements. According to these viewpoints, even while efficiency is increasing, job creation may be constrained if productivity increase hinders wage growth and disproportionately favors capital owners (Storm & Naastepad, 2012).

Furthermore, endogenous growth theories claim that long-term employment benefits can be produced by sustained productivity growth propelled by technological innovation, particularly when coupled with investments in human capital and skill development (Romer, 1990). This concept posits that innovation generates new industries and labor demand in addition to increasing efficiency.

The relationship between labor productivity and employment is complicated and depends on a number of factors, including macroeconomic conditions, labor market institutions, the adoption of new technologies, and governmental interventions. This is highlighted by theoretical approaches to the relationship.

2.2.1. Neoclassical Approach

The marginal productivity theory of labor, which maintains that businesses recruit workers until the real pay matches the marginal product of labor, is the foundation of the neoclassical approach to the labor productivity–employment relationship (Solow, 1956). According to this theory, if labor markets are competitive and wages are flexible, then gains in labor productivity improve the marginal product of labor, which in turn raises real wages and may result in more jobs.

From this perspective, advancements in technology, human capital development, and capital accumulation drive productivity growth. Higher productivity enables businesses to increase wages without eroding profitability, thereby stimulating labor supply and fostering job creation (Mankiw, 2020). Moreover, productivity gains reduce unit labor costs, enhancing the global competitiveness of goods and services, which in turn boosts demand for both labor and output.

Nonetheless, the neoclassical model also recognizes the potential for technical advancements that could save labor, as increased productivity could lessen the

demand for labor in some industries. Employment impacts in these situations rely on how well the output effect—where reduced production costs boost output and labor demand in other sectors—and the substitution effect—where capital replaces labor—are balanced (Aghion & Howitt, 1994).

The neoclassical method typically makes the assumption that labor markets are clear, which implies that any unemployment is frictional or voluntary. Short-term changes in aggregate demand do not ultimately determine employment levels; instead, supply-side factors like labor market participation, demographics, and institutional structures do (Lucas, 1972).

2.2.2. Keynesian Approach

The Keynesian perspective on the relationship between labor productivity and employment places a strong emphasis on how aggregate demand affects employment levels. Keynesian economics states that while better labor productivity can result in higher output and wealth, technological unemployment may occur if aggregate demand does not increase proportionately (Keynes, 1936). This happens when increases in productivity lower the demand for labor before new demand is created to take in the displaced workers.

According to Keynes, , wages represent not only a cost of production but also a crucial source of demand. When wage growth fails to keep pace with productivity gains, household consumption may stagnate, thereby constraining aggregate demand and diminishing firms' incentives to expand output and employment (Robinson, 1937). In such circumstances, government fiscal interventions, such as income redistribution and public investment, can help align productivity growth with demand expansion.

A further feature of the Keynesian paradigm is the multiplier effect, which states that an initial rise in spending, whether from the government or the private sector, leads to subsequent rounds of income and consumption, which in turn boost overall employment (Hansen, 1953). This process implies that in order to guarantee favorable employment results, policies that increase demand must be implemented in addition to productivity gains.

All things considered, the Keynesian approach emphasizes that the relationship between employment and productivity is not always clear-cut and is contingent upon proactive demand management measures, wage dynamics, and macroeconomic circumstances.

2.2.3. Sectoral Dynamics and Structural Transformation

The reallocation of labor and resources across sectors as economies grow is emphasized by the sectoral dynamics and structural transformation approach to the labor productivity–employment link. This viewpoint holds that productivity development frequently varies greatly among industries, which causes changes in employment shares over time (Kuznets, 1973). Labor is typically transferred from low-productivity industries, like agriculture, to higher-productivity ones as part of structural transformation.

The overall impact of this reallocation on employment may be complicated. Productivity increases in manufacturing and services can result in job losses in conventional industries, causing transitory unemployment, even though they may increase overall output and earnings (Herrendorf, Rogerson, & Valentinyi, 2014). The economy's capacity to retrain workers displaced from contracting industries and create new jobs in growing areas will determine the overall effect on employment.

Globalization and advancements in technology are also intimately related to structural change. New technology adoption can boost productivity, but it can also disproportionately benefit capital-intensive industries, which could lower labor's income share (Rodrik, 2016). Therefore, policies that encourage labor mobility, skill development, and investment in developing industries are crucial to ensuring that structural transformation promotes both broad-based employment and productivity growth.

Ultimately, the sectoral dynamics and structural transformation approach emphasizes how changes in the economic structure mediate the relationship between productivity and employment, with the speed and inclusivity of sectoral transitions influencing long-term employment results.

2.2.4. Technological Change and Automation

The perspective on technological change and automation looks at how technical developments—specifically, automation, robotics, and artificial intelligence—affect the connection between employment and worker productivity. According to Autor, Levy, and Murnane (2003), automation can significantly boost productivity by doing jobs more correctly and effectively than human labor, frequently at a lower cost. But it can also result in job displacement, particularly in sectors that depend on repetition and regularity.

There are two main ways that automation affects jobs, according to economic theory. The displacement effect lowers labor demand in impacted areas when machines take the place of humans in existing tasks. The productivity effect, also known as the compensation effect, occurs when automation boosts output, reduces production costs, and generates demand for workers in new industries and complementary occupations (Acemoglu & Restrepo, 2019).

Automation has historically been linked to job structural shifts from manufacturing to services and, more recently, from agriculture to manufacturing (Bessen, 2018). Even if new technologies have the potential to generate completely new job categories, the transition process may come with high adjustment costs, such as skill mismatches and geographical differences in job creation.

This viewpoint's policy implications highlight the value of education and skill development, active labor market regulations, and innovative approaches that guarantee automation enhances human labor rather than replaces it. Automation-driven productivity increases could worsen inequality and cause employment polarization if such measures are not taken.

2.3. LITERATURE REVIEW

The relationship between labor productivity and employment level is discussed for a long time in both developed and developing economies. Hence, this relationship among labor productivity and employment level is of critical importance for both economic theory and policy-making. Labor productivity is the output corresponding to input derived from the workforce or is described as added value per each hour worked (Angelov, 2023). On the other hand, employment measures how well an economy converts its potential for production into inclusive growth and job creation (ILO, 2021). These two indicators are intertwined closely and their connection is the subject of extensive study in the sphere of economies.

In many economies, particularly those experiencing structural transformation like Turkey, the interaction between labor productivity and employment put forward both opportunities and challenges. In one sense, the increase of labor productivity can lead to rise competitiveness, higher wages and improve living standards (Bassanini and Scorpetta, 2001). On the other side, the reduce in labor demand which sources from increase of labor productivity can be observed in particular sectors because of automation, capital-intensive production or efficiency-driven downsizing. To understand the association between labor productivity and employment is so significant for policymakers because this understanding can help them to constitute effective policies which support economic growth and stability (Angelov, 2023).

Theoretical approaches to this relationship differ depending on structural alternations in production, technological transformation, the degree of labor market flexibility, and sectoral dynamics. Although some studies emphasize the importance of the employment-enhancing impacts of productivity gains, other studies discuss that automation can decrease the demand for labor in high-tech sectors (Autor et al., 2015; Acemoglu and Restrepo, 2019).

In addition, this study aims to contribute to the existing literature on the connection betweenlabor productivity and employment in the labor market. Particularly, this thesis seeks to analyze the relationship between labor productivity and employment levels in Turkey, and to explore how productivity dynamics affect labor market outcomes. Moreover, this research goals to present a comprehensive perspective of how

productivity gains impact employment trends in the Turkish economy and what policy implications can be drawn from the findings.

Initially, this section presents a review of a major international studies, followed by empirical studies focused particularly on Turkey. Finally, the study discusses how this thesis contributes to the existing literature by involving additional macroeconomic variables.

2.3.1. International Studies on the Relationship Between Labor Productivity and Employment Level

Labor productivity is a main factor which has an important on the performance, efficiency and employment level of a country. In addition, the impact of labor productivity on the employment level has an important role in order to evaluate the direction of an economy. Understanding the association between labor productivity and employment level leads to policymakers therefore they can constitute effective policies which support economic growth and stability (Angelov, 2023).

Moreover, the relationship between labor productivity and employment level has been inclusively investigated in the international literature. Many studies state that this relationship differs depending on the economic structure, sectoral differences, and the degree of technological transformation. Although the impact of labor productivity on the employment level varies by sector, the increases in labor productivity are commonly positively associated with employment growth (Bassanini and Scorpetta, 2001).

Acemoglu and Restrepo (2019) thinks that automation technologies increase labor productivity but its effect on the employment level is complex. There are countervailing effects: some of the productivity gains may translate into more demand for labor in non-automated jobs and in other sectors. But even with these impacts factored in, automation generally decreases the labor share in value added because decrease of overall labor demand and they displace workers from the tasks they were previously performing.

Furthermore, the increases in labor productivity have an important effect on the employment level thanks to automation technologies because AI can automate tasks

previously performed by labor or create new duties and activities in which humans can be productively employed. Recent technological change has been biased towards automation, with insufficient focus on existing new tasks where labor can be productively hired. The results of this choice have been labor demand, decreasing labor share in national income, rising inequality and lower productivity growth. They support that current AI developments focus heavily on automation-technologies that replace human labor-rather than existing new tasks that complement human capabilities and this trend has led to decreasing labor demand.

Bonsay et al. (2021) emphasizes the importance of AI on the increase of labor productivity because AI creates technology that boosts productivity and the impact of the employment level can deteriorate the economy of country. For example, China and India exhibits evidence of inappropriate AI use as technological unemployment happens. Specifically, in certain nations, the rise in productivity brings about by artificial intelligence may result in lower unemployment rates. In densely populated nations like China, India so on, the widespread use of AI cannot be tolerated under these circumstances. Similarly, Afonso (2024) highlight that the automation technologies increase the labor productivity and needs skilled labor force. Thus, the employment level of skilled labor force is affected negatively thanks to the increase in labor productivity with automation.

Samuels et al. (2017) observe that the impact of education on the labor productivity and they achieve that education affects the labor productivity and facilitate to find a job, namely matters the positive effect on the employment level. Similarly, Sugiharti et al. (2021) emphasizes that the role of education on the labor productivity is so significant and also increases the employment level. Moreover, Bils and Klenow (2000) support that labor productivity will boost when human resources are enhanced via education and thus the probability that someone will learn new things, get more access to employment, and be more productive rises with the amount of money spent on education.

The overinvestments in the labor force have a negative effect on the labor productivity for large nations because the labor force in this instance is consisted of people with inferior qualifications, investments in these workers specifically depress the economy.

Low-qualified workers don't perform efficiently since they have more free time and can influence others and results the decrease in the employment level (Singh, 2023).

2.3.2. Studies on the Impact of Labor Productivity on the Employment Level in Turkey

A country's ability to heal its standard of living in the long run is subject to its ability to increase its output per worker. In this sense, labor productivity is so important overall economy of country because the labor productivity has a meaningful effect on the employment level and also linked to living standards, directly.

Labor productivity reflects the productivity of labor force in terms of the personal capacities of employees or the intensity of their effort. Lieberman and Kang (2008) define the labor productivity as most common indicator in order to measure the productivity which is the output corresponding to input derived from the workforce or is described as added value per each hour worked. In addition, labor productivity which is based on the availability and quality of labor resources and applied technologies and thus, labor productivity intensely affects the production process and production costs.

Furthermore, there are three important factors which have an impact on the labor productivity. First factor is human capital. Human capital is based on accumulation of knowledge (education and expertise), talent and expertise of an average employee during the economic activity. The second factor is consisted of technological change. New inventions and innovations bring about the development of new products and services, which is company with, rise the productivity. The third factor exists the concept of economies of scale that decrease manufacturing costs (Taylor et al., 2016).

Besides, employment level is one of the main factors that disclose the extent to which the labor force is utilized as a factor of production (TUIK, 2024). In a broad sense, the concept of employment is defined as the active participation of population of working age in economic activities during a particular period. Analyzing the employment level is so significant in order to understand the structure of the labor market. In addition, achieving full employment in other macroeconomic goals is a significant one for a lot of developing countries. Therefore, the importance of factors which have an effect on the

employment level is emphasized instead of the development of economy in existed literature.

Nowadays, labor productivity and employment level are on the policy agenda for developing countries including Turkey. A lot of developing countries search a way in order to boost employment level. The increment in labor productivity is observed as a driving force at employment level because of labor productivity has a significant role on employment level and policymakers should focus on efficient policies which contribute labor productivity and facilitate more equitable distribution of income and assure high rates of investment.

Although there are a lot of studies to examine the relationship between employment level and employment level, empirical studies conducted on Turkey are not more in the existing literature. In addition, these studies indicate that this relationship varies both over time and across sectors.

Özer and Suna (2006) emphasizes that vocational and technical education has an impact on the performance of employee and also contributes the labor productivity. In addition, in this study, it is seen clearly that employee who have a vocational education and training will find a job, easily. This study support that the labor productivity contributes the employment level with positive affect of vocational and technical education on the labor productivity in Turkey.

Balkar (2022) also emphasizes that there is an effect of education on the labor productivity This study discloses that there is a long run equilibrium relationship between the number of students in the secondary education system and the number of employed secondary education graduates in Turkey. Similarly, Şentürk (2014) support that the role of education on the labor productivity is undeniable and there is a strong relation between the level of education and employment level and thus the increase of labor productivity affects employment level associate with education.

Aksu (2017), on the other hand, highlights the importance of education on the labor productivity from the perspective of skilled and unskilled labor force. The findings indicates that the demand of unskilled labor force will decrease and the demand of skilled labor force will increase in next 10-20 years with the contribution of education.

Therefore, this study confirms that there is a positive relationship between labor productivity and employment level especially in the long-run.

Unlike other authors, Özçelik (2020) highlight that labor productivity growth in Turkey mainly sources from within-sector growth that refers to producing more with the same amount of labor by using of new machines and innovative technologies and also this study observes that there is not any relationship between labor productivity and employment level and there is not any impact of labor productivity on the employment level.

It should also be considered that there is a trade-off between employment level and labor productivity in short term because of short-run deviations and frictional changes in economy. In long run, economists believe that labor productivity growth and employment growth move jointly. After 2001, it is seen slow employment growth compare to growth in labor productivity in Turkey. Uzay (2006) highlights that there is a negative and significant but not strong relationship between labor productivity and employment growth in Turkey from 1961 to 2005.

Overall, the literature on Turkey indicates that the effect of labor productivity on employment levels varies considerably over time, particularly in relation to the role of education. Nevertheless, this relationship is generally assumed to be positive.

2.4. DATA AND METHODOLOGY

To understand the dynamics of labor markets in developing economies, it is important to analyze the relationship between productivity and employment within a country-specific context. Turkey is an especially significant case because of its unique economic history since the 1980s, which has been marked by structural reforms, liberalization policies, periodic crises, and demographic shifts. While productivity has improved dramatically, particularly since the 2001 crisis, employment creation has occasionally declined, giving rise to the debate over "jobless growth" in the Turkish economy. In this context, the current study focuses on the long-run and short-run relationships between labor productivity and employment in Turkey. The research uses macroeconomic time-series data from 1988 to 2023, with control variables such as investment trends, demographic pressures, and inflation. Using the Autoregressive

Distributed Lag (ARDL) bounds testing methodology, the study intends to capture both long-term equilibrium correlations and short-run modifications, adding new evidence to the empirical literature on the productivity-employment nexus in Turkey.

2.4.1. Model

This study uses the Autoregressive Distributed Lag (ARDL) approach to examine the short- and long-term dynamics of the labor productivity-employment relationship in Turkey. In order to reflect labor market performance and the level of employment in the economy, the Employment-to-Population Ratio (EPR) is defined as the dependent variable in the model. The choice of explanatory variables is grounded in economic theory and supported by empirical evidence, both of which highlight the critical roles of productivity, investment, demographics, and macroeconomic stability in determining employment outcomes. The econometric model can be written as:

EPRt = f (LPt, GFCFt, ADRt, It)

where:

- **EPRt**: Employment-to-Population Ratio, proxy for labor market performance.
- **LPt:** Labor Productivity, measured as real GDP per hour, capturing efficiency of labor input.
- **GFCFt:** Gross Fixed Capital Formation, representing capital accumulation and investment intensity.
- **ADRt:** Age Dependency Ratio (old-age population), capturing demographic pressures on labor supply.
- **It:** Inflation, measured as percent change in the Consumer Price Index, reflecting macroeconomic stability conditions.

This functional form suggests that price stability, capital formation, and demographic structure all have an impact on employment performance in addition to productivity levels.In its estimable ARDL (p, q) specification, the model is formulated as:

$$\Delta \mathrm{EPR}_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta EPR_{t-i} + \sum_{j=0}^{q1} \gamma_j \Delta \mathrm{LP}_{t-j} + \sum_{k=0}^{q2} \delta_k \Delta \mathrm{GFCF}_{t-k} + \sum_{m=0}^{q3} \phi_m \Delta \mathrm{ADR}_{t-m} + \sum_{n=0}^{q4} \theta_n \Delta \mathrm{I}_{t-n} + \lambda_1 \mathrm{EPR}_{t-1} + \lambda_2 LP_{t-1} + \lambda_3 GFCF_{t-1} + \lambda_4 ADR_{t-1} + \lambda_5 I_{t-1} + \varepsilon_t$$

where **Δ** represents the first-difference operator, **p**, q_1, q_2, q_3, and q_4 denote the optimal lag lengths selected based on information criteria, λ_1, λ_2, λ_3, λ_4, and λ_5 are the coefficients associated with the lagged level variables in the long-run relationship, and ε_t is the error term.

According to the literature, the predicted signs of the explanatory variables are as follows:

- **Labor Productivity (LP):** Expected **positive** effect, as productivity gains can boost competitiveness and output, potentially stimulating labor demand.
- **GFCF:** Expected **positive** sign, indicating that higher investment fosters economic activity and employment opportunities.
- **ADR:** Expected **negative** sign, as demographic aging reduces the share of working-age population, limiting labor supply and increasing dependency pressures.
- **Inflation (I):** Ambiguous; in the short run, expansionary policies may raise employment, but persistently high inflation is generally detrimental to macroeconomic stability and labor market performance.

The ARDL bounds testing approach was chosen because it works effectively with small sample sizes and mixed integration orders (I(0) and I(1)). In order to account for the rich lag structure present in macroeconomic interactions, this specification enables the simultaneous estimation of long-run equilibrium relationships and short-run dynamics.

2.4.2. Data Set

The macroeconomic dataset used in this study is extensive and contains the years 1988–2023, with a particular emphasis on annual variables that have been harmonized for econometric analysis. Each variable was gathered from internationally recognized statistical organizations, guaranteeing data consistency and cross-temporal comparability.

The dataset comprises both labor market and macroeconomic indicators, each chosen with the aim of providing an accurate representation of the determinants of employment and productivity trends in Turkey.

The percentage of employed people to the working-age population (those who are 15 years of age and older) is the dependent variable, or employment-to-population ratio (EPR). This percentage-based indicator, which takes demographic shifts over time into account, offers a reliable depiction of labor market performance. EPR data, which provide stable and globally comparable datasets, were sourced from the World Bank World Development Indicators (WDI).

Labor Productivity (LP), the main explanatory variable, is calculated as GDP per hour worked, adjusted for purchasing power parity (PPP), and expressed in current USD. This variable was indexed to a base year of 2017 (=100) and was derived from the Global Economy Database and OECD productivity statistics. This measure, which focuses on production per hour rather than per worker, provides a more precise representation of productivity trends by accounting for both employment levels and changes in working hours.

The percentage proportion of total fixed investment in GDP known as Gross Fixed Capital Formation (GFCF) serves as a substitute for capital accumulation. A consistent depiction of investment activity in relation to economic production was ensured by gathering annual GFCF figures from Trading Economics and the World Bank. This variable reflects how physical capital affects the dynamics of employment and productivity.

The Age Dependency Ratio (ADR), which takes demographic factors into consideration and also ADR calculates, as a percentage, the proportion of those 65 and older to the working-age population (15–64 years). Long-term structural demographic shifts and their effects on labor market participation were reflected in the data that was obtained from the World Bank WDI.

The final control variable is inflation (I), which is determined by the percentage change in the Consumer Price Index (CPI) from year to year. A measure of price stability and general macroeconomic circumstances that could have an indirect impact on employment and productivity, inflation figures were taken from the World Bank and the Global Economy Database.

Temporal comparability was ensured by converting all nominal variables into constant-price or PPP-adjusted measurements. Productivity indices are presented in relation to a fixed base year (2017), whereas ratios like GFCF-to-GDP and ADR are provided as percentages.

To address heteroskedasticity and facilitate the interpretation of elasticity coefficients, the series were transformed into logarithmic form where appropriate. The dataset was first compiled and organized in Microsoft Excel, and subsequently imported into EViews for econometric analysis, which encompassed ARDL model specification, descriptive statistics, and preliminary unit root tests.

Each variable was rigorously standardized to guarantee scale comparability and enhance interpretability.All explanatory variables are ratios, with the exception of labor productivity (LP), which is expressed as GDP per hour worked (2017=100, PPP-adjusted). The Employment-to-Population Ratio (EPR), Gross Fixed Capital Formation-to-GDP (GFCF/GDP), and Age Dependency Ratio (ADR) are all expressed as percentages, and the Consumer Price Index's annual percentage change is known as inflation (I).

Microsoft Excel was used for data preparation, and EViews 12 was used for econometric analysis, which included lag selection, ARDL bounds testing, and unit root testing (ADF, PP). The final dataset provides a coherent and statistically robust foundation for analyzing the dynamic relationships among investment, labor market performance, productivity, and demographic pressures in Turkey.

2.4.3. Econometric Methodology

This study's econometric technique is based on the Autoregressive Distributed Lag (ARDL) limits testing method for cointegration, which was first created by Pesaran, Shin, and Smith (2001). According to Nkoro and Uko (2016), the ARDL framework is especially useful because it permits the estimation of both short-term dynamic adjustments between variables and long-term equilibrium relationships, even when regressors have mixed integration orders: integrated of order zero, I(0), and order one, I(1), as long as none of the variables are integrated of order two, I(2).

Because variables like labor productivity, employment, capital creation, and demographic indicators frequently show distinct stochastic features, this flexibility is essential in macroeconomic time series research. Additionally, the ARDL method is well-known for its effectiveness with small samples and its ability to include rich lag dynamics, which makes it suitable for yearly data covering 1988–2023.

2.4.3.1. Unit Root Tests

In recent years, the unit root test has been widely employed to determine whether a series is stationary or non-stationary. It will first be described, then illustrated, and finally its limitations will be discussed.

$Y_t = \rho Y_{t-1} + u_t \qquad -1 \le \rho \le 1 \qquad$ **(1)**

where u_t is a white noise error term

If ρ = 1 (unit root), Eq. (1) converts into a nonstationary stochastic process known as a random walk with no drift. Thus, why not simply regress Y_t on its (one-period) lagged value $Y_{t-1}$and find out if the estimated ρ is statistically equal to 1? If it is, then Y_t is nonstationary. This reflects the general rationale underlying the unit root test of stationarity. Ordinary Least Squares (OLS) cannot be used to estimate Eq. (1) and test the hypothesis ρ = 1, as the t-test is biased in the presence of unit roots. Consequently, Eq. (1) is reformulated by subtracting from both sides, yielding the following expression:

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t$$
$$= (\rho - 1)\, Y_{t-1} + u_t \qquad \textbf{(2)}$$

which can be alternatively written as:

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad \textbf{(3)}$$

where δ = (ρ − 1) and Δ , as usual, is the first difference operator.

In practice, instead of estimating Eq. (1), I estimate Eq. (3) and test the null hypothesis (δ = 0) against the alternative hypothesis (δ < 0.). If δ = 0, then ρ = 1, this indicates that the time series is nonstationary. It should be mentioned before I estimate Eq. (3) that if δ = 0, Eq. (3) will become

$$Y_t = (Y_t - Y_{t-1}) = u_t \quad \textbf{(4)}$$

Since ut is a white noise error term, it is stationary. This implies that the first differences of a random walk time series are also stationary, as previously stated (Gujarati & Porter, 2009, pp. 754-758).

In econometric analysis, testing the stationarity of time series is an essential step. The Dickey–Fuller (DF), Augmented Dickey–Fuller (ADF), and Phillips–Perron (PP) tests are the most often used methods for this purpose. Although the DF test offers a simple autoregressive framework for analyzing unit roots, it is extremely susceptible to specification mistakes and autocorrelation. The ADF test accounts for serial correlation in the error term by using lagged differences of the dependent variable in order to overcome these constraints.

The PP test also provides more robust results under general types of disturbances by compensating for potential heteroskedasticity and autocorrelation in the residuals without the need for lag augmentation. Multiple unit root tests improve the reliability of the inference about the order of integration. In this work, consistency between the two approaches is considered, and the ADF and PP tests are used mainly to analyze the stationarity features of the series.

2.4.3.2. ARDL Bounds Test

In time series regression analysis, a distributed-lag model includes both current and lagged values for explanatory variables (X's). An autoregressive model has explanatory variables that include lagged values of the dependent variable.

Consequently,

Y_t = α + $\beta_0 X_t$ + $\beta_1 X_{t-1}$ + $\beta_2 X_{t-2}$ + u_t **(5)**

symbolizes a distributed-lag model, but

Y_t= α + βX_t + γY_{t-1}+ u_t **(6)**

illustrates an autoregressive model. These are also referred to as dynamic models since they show how the dependent variable changes over time in relation to its previous value or values.

The relationship between a variable (Y), the dependent variable, and one or more explanatory variables (X) is rarely instantaneous in economics. In most cases, Y reacts to X after some time has passed.

In a general, it could be written

Y_t = α + $\beta_0 X_t$+ $\beta_1 X_{t-1}$+ $\beta_2 X_{t-2}$ + …… + $\beta_k X_{t-k}$+ u_t **(7)**

which is a distributed-lag model with a finite lag of k time periods. The short-run, or impact, multiplier is the coefficient β0, which provides the change in the mean value of Y after a unit change in X over the same time period. If X remains unchanged, then (β_0+ β_1) yields the change in (the mean value of) Y in the subsequent period, (β_0+ β_1+ β_2) in the subsequent period, and so on. These partial sums are referred to as intermediate or interim multipliers. Eventually, it is acquired after k periods

$\sum_{i=0}^{k} \beta_i = \beta_0 + \beta_1 + \beta_2 \ldots + \beta_k = \beta$ **(8)**

and the long-run, or total, distributed-lag multiplier exists when the sum β exists. Assuming that it is described as

$$\beta_i^* = \frac{\beta_i}{\sum \beta_i} = \frac{\beta_i}{\beta} \quad \textbf{(9)}$$

and it's referred to as "standardized" β_i. The percentage of the long-term, or overall,

influence experienced by a specific time period is thus provided by partial sums of the standardized β_i (Gujarati & Porter, 2009, pp. 617-619).

Formally, the baseline model is expressed as follows:

$$\boldsymbol{EPR_t = f\,(LP_t, GFCF_t, ADR_t, I_t)}$$

where EPRt is the **Employment-to-Population Ratio**, serving as the dependent variable, $\boldsymbol{LP_t}$ is **Labor Productivity** (GDP per hour), $\boldsymbol{GFCF_t}$ denotes **Gross Fixed Capital Formation**, $\boldsymbol{ADR_t}$ represents the **Age Dependency Ratio (old population)**, and $\boldsymbol{I_t}$ is **Inflation**, measured by using Consumer Price Index. The formula for the estimated ARDL(p, q) model is:

$$\boldsymbol{\Delta EPR_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta EPR_{t-i} + \sum_{j=0}^{q1} \gamma_j \Delta LP_{t-j} + \sum_{k=0}^{q2} \delta_k \Delta GFCF_{t-k} + \sum_{m=0}^{q3} \phi_m \Delta ADR_{t-m} + \sum_{n=0}^{q4} \theta_n \Delta I_{t-n} + \lambda_1 EPR_{t-1} + \lambda_2 LP_{t-1} + \lambda_3 GFCF_{t-1} + \lambda_4 ADR_{t-1} + \lambda_5 I_{t-1} + \varepsilon_t}$$

where **Δ** represents the first-difference operator, $\boldsymbol{p, q_1, q_2, q_3, q_4}$ are optimal lag lengths selected via Akaike Information Criterion (AIC), and ε_t is a white-noise error term.

The ARDL limits test investigates the null hypothesis of no cointegration in accordance with Pesaran et al. (2001):

$$\boldsymbol{H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0} \qquad \textbf{(10)}$$

against the alternative of cointegration. Using two sets of asymptotic critical values—one assuming all variables are I (0) and the other assuming all are I (1)—the calculated F-statistic is compared. There is a long-term equilibrium relationship between the variables, as the null hypothesis is rejected if the statistic is greater than the upper bound.

2.4.3.3. Error Correction Mechanism (ECM)

It has been demonstrated that EPR and LP are cointegrated, indicating the existence of a long-term, or equilibrium, relationship between the two once the (linear) trend is accounted for. In the short run, however, deviations from equilibrium may occur. The

error term in the equation below can therefore be interpreted as the 'equilibrium error,' which may be used to link the short-run dynamics of EPR to its long-run equilibrium value:

u_t = EPR_t − β_1 − β_2 LP − $\beta_3 t$ **(11)**

The error correction mechanism (ECM) first used by Sargan (1984) and later popularized by Engle and Granger corrects for disequilibrium. A significant theorem called the Granger representation theorem asserts that the relationship between two variables, Y and X, can be represented as ECM if they are cointegrated. Now, examine the following model:

$LERP_t$= a_0 + a_1 LLP_t+ a_2 u_{t-1}+ ε_t **(12)**

where $\varepsilon_t$is a white noise error term and $u_{t-1}$is the lagged value of the error term in Eq. 12. ECM equation **(12)** states that LERP depends on LLP and also on the equilibrium error term. If the latter is not zero, the model is out of balance. Assume ∆LEPR is zero and u_{t-1} *is* positive. This indicates that $LERP_{t-1}$exceeds the equilibrium value of (a_0+ $a_1 LLP_{t-1}$). Since a_2 is predicted to be negative, the term a_2 u_{t-1} is also negative; as a result, in order to reestablish equilibrium, $\Delta LERP_t$ will also be negative.

In other words, if $LERP_t$ is higher than its equilibrium value, it will begin to decrease in the following period in order to correct the equilibrium error; therefore, the term ECM.

Similarly, if u_{t-1} is negative (that is, LERP is below its equilibrium value), then $a_2 u_{t-1}$ will be positive, which will result in a positive $LERP_t$ and a rise in $LERP_t$ over period t. Therefore, how quickly the equilibrium is reestablished depends on the absolute value of a_2. In practice, it is estimated u_{t-1} by $\hat{u}_{t-1}$ = ($LERP_t$− $\hat{\beta}_1$ − $\hat{\beta}_2$ LLP − $\hat{\beta}_3 t$) (Gujarati & Porter, 2009, pp. 764-765).

The ECM form of the ARDL model is used to model the short-run dynamics after cointegration has been established:

$$\mathbf{\Delta EPRt = \alpha + \sum_{i=1}^{p} \beta i \Delta EPRt - i + \ldots\ldots + \lambda ECTt{-}1 + \varepsilon t}$$

where **ECTt−1** is the **Error Correction Term** derived from the long-run relationship. Cointegration is confirmed by a negative and statistically significant λ coefficient, which also detects how quickly equilibrium is being adjusted. For instance, an estimated **λ = −0.85** shows a rapid convergence to long-run equilibrium, with almost 85% of the disequilibrium being corrected in a year.

According to Banerjee et al. (1993), the ECM is essential for both detecting short-term deviations and assessing system stability. If the adjustment parameter is stable and significant, the underlying economic relationships are strong, and short-term shocks are absorbed without resulting in long-term disequilibrium.

Additionally, diagnostic and stability tests were performed in order to ensure that the model met the classical regression assumptions and remained stable within the sample period. A number of diagnostic procedures are carried out in order to guarantee the accuracy of the ARDL-ECM estimates:

- **Serial Correlation:** Breusch–Godfrey LM test,
- **Heteroskedasticity:** Breusch–Pagan/White tests,
- **Functional Form:** Ramsey RESET test,
- **Normality:** Jarque–Bera test for residuals.

The CUSUM and CUSUMQ tests are used to evaluate the stability of coefficients (Brown et al., 1975). Both tests assess recursive residuals and verify that model parameters remain stable in the face of structural shifts in the Turkish economy, such as the crises of 1994, 2001, and 2008.

In contrast to other cointegration methods like Engle and Granger (1987) or Johansen (1991), the ARDL bounds testing methodology is recommended because:

- It supports mixed integration order regressors,
- Enables efficiency for small samples.
- Analyzes short- and long-term dynamics using a single framework, and
- Allows it easier to understand policy by using the ECM adjustment coefficient.

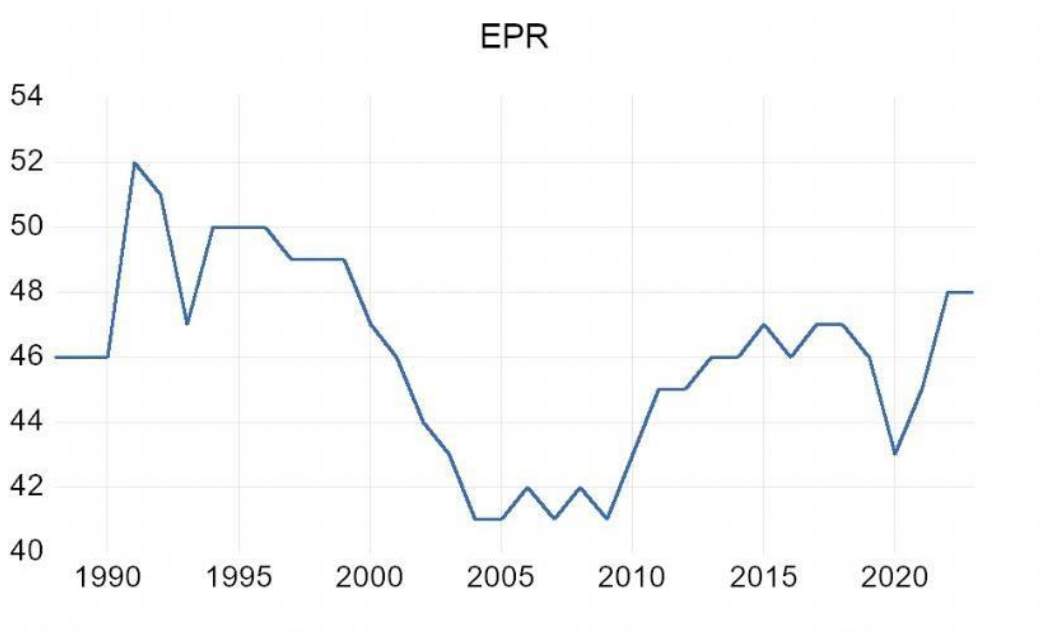
The ARDL-ECM framework provides a theoretically strong and empirically accurate approach to analyze the productivity–employment relationship in Turkey, since this study employs annual data for 1988–2023 and contains important macroeconomic and demographic variables The ARDL-ECM framework provides a theoretically strong and empirically accurate approach to analyze the productivity–employment relationship in

Turkey, since this study employs annual data for 1988–2023 and contains important macroeconomic and demographic variables.

2.5. EMPIRICAL FINDINGS

The long-term changes in Turkey's employment-to-population ratio (EPR) from 1988 to 2023 are depicted in Figure 9. The statistics show many distinct phases that correspond to the Turkish economy's cyclical dynamics and structural changes.

Figure 9: Employment Rate Changes in Turkey from 1988 to 2023



Source: Author's own illustration based on World Bank (2025) data.

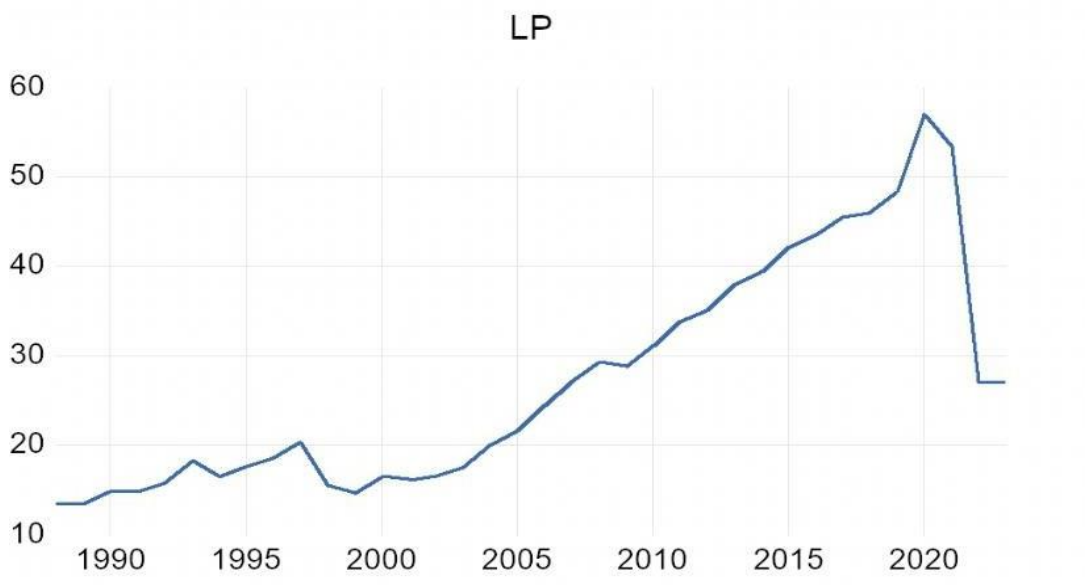
The EPR stayed at quite high levels in the early 1990s, reaching a peak of about 52 percent in 1992–1993. Rapid changes in the labor market and demographics occurred during this time, but macroeconomic instability also caused noticeable short-term fluctuations. The EPR stayed at 50% by the mid-1990s, indicating that about half of people of working age were employed. A pronounced downward trend emerged in the late 1990s and intensified in the early 2000s. Employment contracted substantially, driven by structural rigidities, the repercussions of the 1999 earthquake, and the severe financial crisis of 2001. The employment-to-population ratio declined sharply, reaching a low of approximately 41 percent in 2005. This period is often characterized by rising unemployment and the challenges of 'jobless growth,' as output expanded while employment opportunities remained stagnant.

After 2010, the EPR began to recover gradually. Over the subsequent decade, the ratio rose steadily and stabilized at the mid-40 percent range. This improvement was supported by enhanced macroeconomic stability, labor market reforms, and increased participation in non-agricultural sectors. Nevertheless, the EPR did not return to the higher levels observed in the early 1990s, indicating the persistence of structural constraints within the Turkish labor market.

The COVID-19 pandemic's effects are most noticeable in the years after 2020. Widespread disruptions in economic activity and a downturn in labor demand caused the EPR to drop precipitously once more, to almost 43 percent. In the post-pandemic period, the data also indicates a partial normalization, with the EPR returning to roughly 48 percent by 2022-2023.

Overall, the EPR's trend from 1988 to 2023 shows a long-term decline in the percentage of working-age individuals who are employed, interrupted with occasional downturns and temporary recoveries. These dynamics highlight how crucial it is to take into account both short-term and structural issues when assessing employment performance in Turkey, including crises, demographic shifts, and policy reforms.

Figure 10: Labor Productivity Changes in Turkey from 1988 to 2023



Source: Author's own illustration based on data obtained from the OECD database (accessed via Global Economy, 2025).

Figure 10 shows Turkey's labor productivity (LP) trend over the long term, from 1988 to 2023. A modest but consistent rise over three decades, representing capital accumulation, technology adoption, and structural transformation, is shown in the graph. This is followed by a sharp drop in the wake of the COVID-19 epidemic.

Labor productivity levels in the late 1980s and early 1990s were comparatively low, averaging between 12 and 15 units. Turkey's economic volatility and persistent macroeconomic imbalances throughout this time are reflected in the early years' gradual increasing trend with occasional fluctuations. The early 2000s saw a slowdown in productivity growth, with temporary increases frequently undone by crises like the 1994 currency crisis and the 1999 earthquake.

The early 2000s saw the beginning of an obvious upward trend that followed the recovery from the 2001 crisis and the structural changes that resulted, which increased economic efficiency and made Turkish sectors more competitive. Labor productivity grew quickly from 2002 onward, rising from about 15 units to almost 30 by 2010. Integration into international trade networks, increased investment, and more macroeconomic stability all contributed to this acceleration.

The most sustained period of productivity development was between 2010 and 2019, when LP increased from about 30 to over 50 units. This consistent upward trend shows the benefits of increased capital creation, sectoral labor reallocation toward more productive non-agricultural activities, and the role of technology adoption. Yet, because productivity gains were not always accompanied by corresponding increases in employment, worries about "jobless growth" grew more apparent despite this impressive achievement.

The graph's most noticeable feature is the sharp decline in labor productivity that occurred after 2020, from a peak of about 58 units to about 27 units by 2023. The COVID-19 pandemic's disruptive impacts, which resulted in output losses, changes in labor market participation, and significant structural shocks across various sectors, are responsible for this unexpected collapse. The extent of the decline points to the continuation of structural problems in the Turkish labor market and economy in addition to a cyclical recession.

In general, the labor productivity trend from 1988 to 2023 highlights Turkey's potential to attain sustained productivity increases in the presence of good macroeconomic and structural circumstances, but it also highlights its vulnerability to crises. The recent period's rapid decline raises the question whether previous productivity growth can be sustained and emphasizes the necessity of refocusing policy attention on innovation, human capital, and strong labor market structures.

2.5.1. Descriptive Statistics

Table 1: Descriptive Statistics Results

Variable	Mean	Std. Dev.	Min	Max	Obs
EPR	45.97222	2.999868	41.00000	52.00000	36
LP	27.20000	12.70460	13.40000	57.00000	36
GFCF	25.58034	3.271955	17.9503	31.85664	36
ADR	10.22222	1.914025	8.00000	15.00000	36
I	38.58056	31.74778	6.30000	105.20000	36

Source: Author's calculation based on OECD, World Bank Database.

Employment-to-Population Ratio (EPR), Labor Productivity (LP), Gross Fixed Capital Formation (GFCF), Age Dependency Ratio (ADR), and Inflation (I) are the variables used in the study, and Table 1 presents the descriptive data for each. The findings offer valuable information about the data's variability and distributional characteristics during the sample period (1988-2023).

EPR has a a mean of roughly 45.97 percent, indicating a comparatively consistent central tendency during the time period. Although GFCF averages 25.58 units, labor productivity (LP) averages 27.20 units. Both indicators suggest that investment and productivity levels remained moderate within the economy. Turkey's history of chronic inflation during the 1990s and early 2000s is evident in the substantially higher average inflation rate (I) of 38.58, alongside an average Age Dependency Ratio (ADR) of 10.22.

EPR's standard deviation of 2.99 indicates a comparatively moderate degree of variability, which is in accordance with its slow long-term fluctuations. LP and GFCF

show greater dispersion (standard deviations = 12.70 and 37.19, respectively), indicating that investment and production are more dynamic. The most volatile indicator is inflation, which highlights Turkey's history of macroeconomic instability with a standard deviation of 31.75, a maximum of 165.2, and a minimum of 5.3. ADR has a standard deviation of 9.14, showing moderate volatility.

In contrast to the considerable variability in productivity, investment, and particularly inflation, the descriptive statistics show that the employment ratios in the Turkish economy have been rather steady. The findings demonstrate that, although there have been periods of turbulence, productivity and the age dependency ratio have increased over time, while employment ratios have been relatively steady.

2.5.2. Unit Root Tests

Table 2: Unit Root Test Results (ADF and PP)

Variable	ADF(Level)	ADF (1^{st} Diff.)	PP(Level)	PP (1^{st} Diff.)	Result
EPR	-1.768301 (0.3894)	-5.963807** (0.0000)	-1.728786 (0.4085)	-5.963807** (0.0000)	I (1)
LP	0.085771 (0.9597)	-6.340117** (0.0000)	-1.507827 (0.5180)	-4.857106*** (0.0000)	I (1)
GFCF	-1.572346 (0.4858)	-6.364248** (0.0000)	-1.575583 (0.4842)	-6.392337** (0.0000)	I (1)
ADR	1.573982 (0.9992)	-5.592941** (0.0000)	2.139479 (0.9999)	-5.580209** (0.0001)	I (1)
I	-1.414793 (0.5639)	-6.043595** (0.0000)	-1.381125 (0.5802)	-6.046639*** (0.0000)	I (1)

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests for the variables used in the model—inflation (I), gross fixed capital formation (GFCF), employment-to-population ratio (EPR), labor productivity (LP), and age dependency ratio (for old) (ADR)—are presented in Table 2. Each variable was examined both at the level and the first difference levels.

Employment-to-Population Ratio (EPR): The p-values above 0.05 indicate non-stationarity, and the ADF and PP statistics at level (-1.76 and -1.72, respectively) are not statistically significant. Both tests, however, yield very significant findings following

first differencing (ADF = -5.96, PP = -5.96, p = 0.0000), demonstrating that EPR is integrated of order one, I(1).

Labor Productivity (LP): The null hypothesis of a unit root cannot be rejected at levels according to both the ADF (0.08) and PP (-1.51) tests, with p-values of 0.95 and 0.51, respectively. However, the null is decisively rejected after first differencing (ADF = -6.34, PP = -4.85; both significant at the 1% level), indicating that LP is integrated of order one, I(1).

Gross Fixed Capital Formation (GFCF): The results are consistent with those obtained for the previous variables. At levels, the ADF and PP statistics (-1.57 and -1.57) are not statistically significant, however, both tests strongly reject the null hypothesis of a unit root at first difference (ADF = -6.36, PP = -6.39; p = 0.0000). These findings indicate that the GFCF series is integrated of order one, I(1).

Age Dependency Ratio (ADR): The ADF (1.57) and PP (2.13) statistics at levels, with p-values of 0.99, provide no evidence of stationarity. By contrast, both tests become strongly significant after first differencing (ADF = -5.59, PP = -5.58; p < 0.01), confirming that ADR is non-stationary in levels but stationary in first differences, and thus integrated of order one, I(1).

Inflation (I): Similar to the other variables, inflation is non-stationary in levels (ADF = -1.41, PP = -1.38; p-values > 0.56). However, after first differencing, both the ADF (-6.04) and PP (-6.04) statistics are highly significant at the 1% level, indicating that the inflation series is integrated of order one, I(1).

All variables under consideration—EPR, LP, GFCF, ADR, and inflation—are consistently shown to be non-stationary at levels but to become stationary following initial differencing, according to the findings of the ADF and PP tests. All series are therefore integrated of order one, I(1). This result supports the usage of the ARDL bounds testing framework, which permits a combination of I(0) and I(1) regressors but requires that the variables cannot be integrated of order two, I(2).

2.5.3. ARDL Bounds Test

Table 3: ARDL Bounds Test for Cointegration

K	F Statistic	Significance Level	I (0)	I (1)
4	7.704925	10 %	2.696	3.898
		5 %	3.276	4.63
		1 %	4.49	6.368

The ARDL bounds testing method was used to determine whether a long-term relationship between the variables existed, and the findings are shown in Table 3. The critical limits values at various significance levels are compared to the calculated F-statistic (7.7049).

- At the **10% significance level**, the lower and upper bounds are 2.696 and 3.898, respectively.
- At the **5% significance level**, the critical values are 3.276 (I(0)) and 4.63 (I(1)).
- At the **1% significance level**, the bounds are 4.49 and 6.368.

Since the calculated F-statistic (7.7049) surpasses the upper bound critical value at the 1% level (6.368), the null hypothesis of no co-integration is rejected. Accordingly, the results provide evidence of a statistically significant long-term equilibrium relationship between the variables.

In particular, the F-statistic (7.70) surpasses the upper bounds critical values at all conventional significance levels, suggesting that the variables move together in the long run despite possible short-run fluctuations, concluding that the ARDL bounds test results strongly support the existence of a long-run co-integrating relationship among the variables.

The high F-statistic validates that the stated ARDL model accurately represents the long-run dynamics between the dependent variableand explanatory variables, eliminating the risk of spurious regression. The use of an Error Correction Model (ECM) to assess short-run adjustment processes is supported by the evidence of cointegration, which also confirms the calculation of long-run coefficients within the ARDL framework. In spite of the variables exhibiting a mixed order of integration (I(0) and I(1)), the results demonstrate that the model is econometrically well-specified and effectively captures the underlying economic relationships.

In conclusion, the ARDL Bounds Test, yielding a highly significant F-statistic with K = 4 explanatory variables, validates the structural integrity of the model and supports the reliability of the long-run coefficient estimates. These findings emphasize the econometric strength of the ARDL approach in modeling the productivity–employment relationship in Turkey, thereby affirming the study's methodological rigor.

Table 4: Long Run Coefficients Variables

	Coefficient	Std. Error	t-statistic	Prob. Value
LP (Labor Productivity)	0.287760	0.080716	3.565107	0.0017**
Control Variables				
GFCF	0.3431	0.234571	1.463022	0.1576
ADR	-2.513875	0.521747	-4.818183	0.0001**
I	0.044536	0.016310	2.730641	0.0122**

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The estimated long-run coefficients of the ARDL model are shown in Table 4. The dependent variable in this model is the employment rate (EPR), the primary explanatory variable is labor productivity (LP), and the control variables are gross fixed capital formation (GFCF), age dependency ratio for the old population (ADR), and inflation (I).

Labor Productivity (LP): The coefficient of labor productivity (LP) is estimated at 0.2877 and is statistically significant at the 1% level (t = 3.565, p = 0.0017). This indicates that employment is positively influenced by productivity in the long run. Specifically, a one-unit increase in labor productivity is associated with an approximate 0.29-unit rise in the employment rate, underscoring the role of productivity growth in fostering job creation within the Turkish economy.

Gross Fixed Capital Formation (GFCF): It would be illogical to analyze this coefficient further given its lack of statistical significance; as a result, no significant conclusions are made regarding this variable.

Age Dependency Ratio (ADR – Old Population): The ADR coefficient is negative and statistically significant at the 1% level (-2.5138; t = -4.818, p = 0.0001), reflecting the considerable adverse impact of old-age dependency on employment. The results imply that as the proportion of elderly relative to the working-age population rises, the labor supply diminishes, thereby posing structural demographic challenges. This evidence highlights the importance of demographic factors in determining labor market performance in Turkey and signals long-term concerns regarding social security systems and employment sustainability.

Inflation (I): At the 5% level, the coefficient of 0.0445 is statistically significant (t = 2.730, p = 0.0122). The positive association indicates a long-run relationship between higher inflation and increased employment. This outcome may reflect the influence of expansionary policies that boosted labor demand during periods of inflation or the short-term dynamics described by the Phillips curve. However, given that persistent inflation undermines long-term macroeconomic stability, the sustainability of such an employment effect remains questionable.

According to the long-term ARDL results, the old-age dependency ratio has a statistically significant adverse impact on employment in Turkey, while labor productivity enhances employment and inflation exerts a minor positive effect. This evidence highlights demographics as a key structural limitation on labor market performance.

Table 5: Error Correction Term Coefficient

	Coefficent	Std. Error	t-Statistic	Prob. Value
ECT_{t-1}	-0.851645	0.126216	-6.747526	0.0000***

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5 reports the estimated coefficient of the error correction term (ECT_{t-1}) derived from the ARDL-ECM specification. The coefficient is –0.8516, with a t-statistic of –6.7475 and a probability value of 0.0000, which is statistically significant at the 1% level.

This indicates to the validity of the long-term equilibrium relationship between the variables in the model. In particular, the error-correction coefficient of –0.85 indicates that, with annual observations, nearly 85% of short-run disequilibria are eliminated within one period. This result points to a relatively fast adjustment process, ensuring convergence to the long-run equilibrium path.

Methodologically, the ARDL bounds test confirms the existence of a cointegration relationship, while the significance of the error correction term (ECT) validates the consistency of the ARDL-ECM estimates in both the short and long run. Economically, the ECT coefficient (-0.85) indicates a very rapid adjustment process, with approximately 85% of any short-run disequilibrium corrected within a year and half of the imbalance dissipating in less than nine months.

This evidence highlights the stability of the long-run relationship among labor productivity, capital formation, inflation, employment, and demographic factors, suggesting that shocks to the Turkish labor market-productivity system are largely transitory and do not generate persistent imbalances.

2.5.4. Diagnostic Statistics

Table 6: Diagnostic Statistics Results

	F-Statistic	Probability Values
LM	0.227815	0.7983
Breusch Pagan	0.396265	0.9343
Ramsey Reset	2.321035	0.1426
Jargue-Bera	0.931557 (jargue bera stat.)	0.627646

A number of diagnostic tests were performed to evaluate the ARDL model's validity and robustness, and the findings are presented in Table 6. Serial correlation, heteroskedasticity, functional form misspecification, and residual normality are all tested.

The Breusch–Godfrey LM test, which measures serial correlation, produces an F-statistic of 0.2278 and a probability value of 0.7983. Since the p-value substantially exceeds the 5% threshold, the null hypothesis of no serial correlation cannot be rejected. This result suggests that the residuals are free from autocorrelation, thereby validating the appropriateness of the chosen lag structure.

Breusch–Pagan test which measures for heterockedasticity and the probability value of its test statistic is 0.9343 and the Breusch-Pagan test statistic is 0.3963. Once again, the p-value is higher than the conventional thresholds, indicating that the homoskedastic residuals null hypothesis cannot be rejected. The variance of the residuals is therefore constant, and the model is not heteroskedastic.

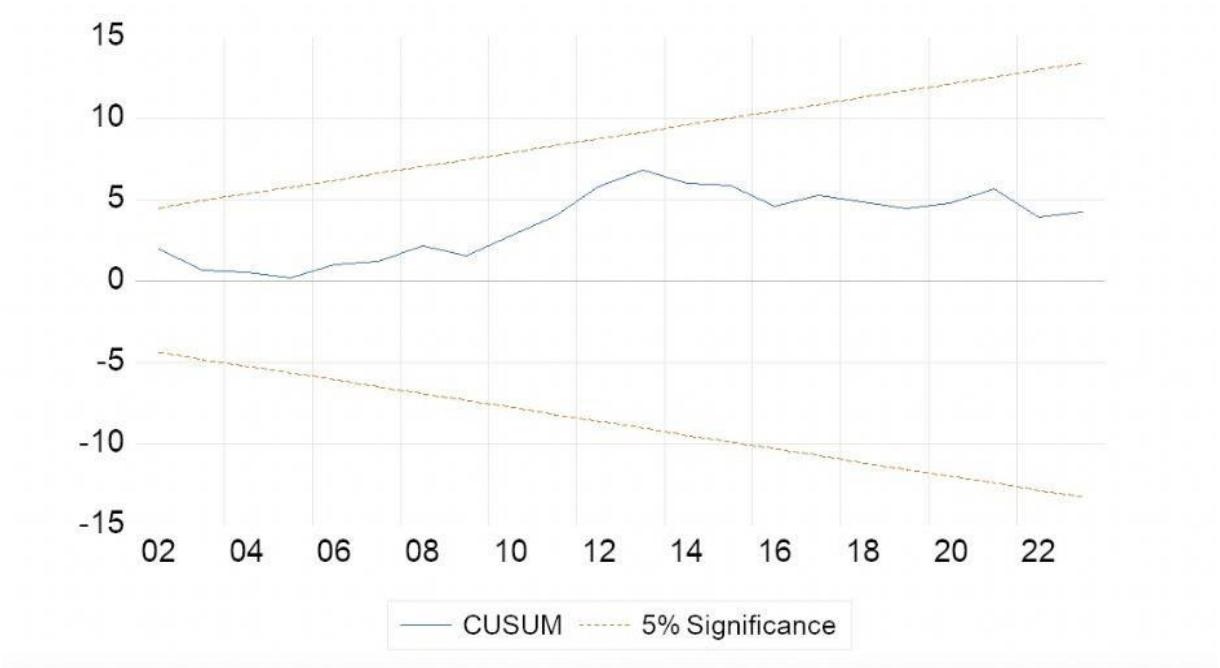
Ramsey RESET Test (Functional Form) yields an F-statistic of 2.3210 and a probability of 0.1426. No evidence of model misspecification exists because the null hypothesis of accurate functional form cannot be rejected at the 5% level. This proves that the ARDL functional form is valid.

The Jarque-Bera test for normality has a probability value of 0.6276 and a statistic of 0.9316. According to this result, the residuals are normally distributed, which is a crucial need for reliable statistical inference.

According to the diagnostic tests, the estimated ARDL model demonstrates validity and robustness. Specifically, the lack of autocorrelation, heteroskedasticity, and functional misspecification, alongside normally distributed residuals, indicates that the model yields reliable and consistent estimates of the employment-labor productivity nexus in Turkey.

2.5.5. CUSUM Tests

Figure 11*:* CUSUM Test of Recursive Residuals



Source: Author's own computation using EViews 12 outputs.

The CUSUM (Cumulative Sum of Recursive Residuals) stability test results for the ARDL model are presented in Figure 11. To identify potential structural changes in the estimated coefficients over time, the CUSUM test is a recursive method that assesses the cumulative behavior of residuals. Throughout the sample period, parameter stability is assumed by the test's null hypothesis.

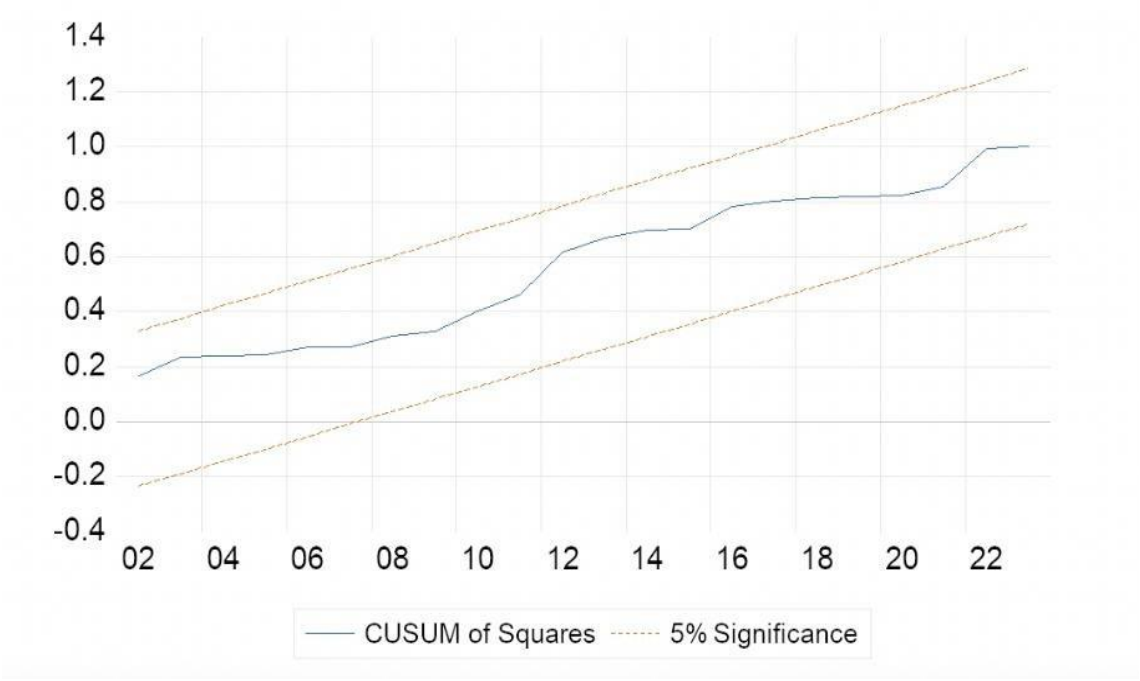
The figure shows that over the whole sample border, the CUSUM line varies between the upper and lower 5% significant bounds. This result suggests that, at the 5% significance level, the estimated parameters of the ARDL model do not exhibit any signs of parameter instability or systematic structural breaks. The CUSUM statistic's moderate movements and return to the mean provide further confidence to the model specification's validity.

From a methodological perspective, the CUSUM test is particularly valuable as it provides a time-varying assessment of model stability, complementing traditional diagnostic tests such as serial correlation, heteroskedasticity, and normality checks. Unlike conventional tests that evaluate residual properties in a global sense, the CUSUM procedure allows for the detection of local structural changes that may undermine the reliability of both short- and long-run estimates.

Given Turkey’s history of macroeconomic shocks, including the 1994 currency crisis, the 2001 financial crisis, and the 2008 global crisis, the stability of the estimated coefficients is particularly noteworthy. The robustness of the ARDL bounds test and subsequent ECM is reinforced by the presence of a negative and statistically significant error correction term alongside stable coefficients, confirming the validity of the long-run equilibrium relationship.

Overall, the CUSUM results demonstrate that the model is free from structural instability and misspecification, thereby underscoring the reliability of the estimated productivity–employment relationship in Turkey.

Figure 12: Cusum of Squares Test for Parameter Stability



Source: Author's own computation using EViews 12 outputs.

The stability of the variance of the estimated coefficients in the ARDL model is examined using the CUSUM of Squares (CUSUMQ) test, as presented in Figure 12. Unlike the standard CUSUM test, which detects systematic shifts in the mean of recursive residuals, the CUSUMQ test is particularly sensitive to structural breaks in the variance of the error terms, thereby providing additional evidence of the robustness of the estimated results.

As illustrated in the figure, the CUSUMQ line remains within the 5% significance boundaries throughout the sample period. This indicates that the null hypothesis of parameter stability cannot be rejected. In other words, the estimated model exhibits no evidence of variance instability or heteroskedastic structural breaks.

The Turkish economy has undergone several episodes of instability, including the 1994 currency crisis, the 2001 financial crisis, the 2008 global financial crisis, and the COVID-19 shock. In this context, the CUSUMQ test is particularly relevant, as its

statistic remains within the critical bounds, indicating no parameter instability in the estimated ARDL framework.

This stability reinforces the robustness of both the short- and long-run estimates derived from the ARDL–ECM model, ensuring that the significant and negative error correction term reflects a genuine adjustment mechanism toward long-run equilibrium rather than coefficient instability.

Overall, the CUSUM and CUSUMQ results provide strong evidence of the structural reliability of the ARDL model, confirming that the relationship between labor productivity and employment in Turkey remains stable over the sample period and strengthening confidence in the validity of the empirical findings.

2.6. CONCLUSION

The relationship between labor productivity and employment in Turkey during the period 1988–2023 has been empirically investigated in this chapter, within the framework provided by the existing literature. In order to investigate how productivity dynamics impact labor market outcomes in a middle-income economy that is experiencing substantial demographic and sectoral changes, the analysis drew on the conceptual and theoretical foundations presented in this study and combined econometric modeling, structural transformation literature, and macroeconomic theory. The importance of research issue was emphasized in this thesis and also highlighted its policy implications. It was noted that discussions about "jobless growth" and productivity-led structural changes have frequently followed Turkey's growth trend. Using data from the World Bank and OECD. In addition, this thesis put the research in perspective by looking at previous labor market events, such as changes in sectoral employment, labor force participation, and demographic composition. The empirical modeling approach was established as a result of these contextual observations and the relationship between productivity and employment was examined from a variety of theoretical perspectives in this study.

In a middle-income economy that is experiencing significant demographic and sectoral change, the analysis combined econometric modeling with insights from the structural transformation literature and macroeconomic theory to examine how productivity

dynamics affect labor market outcomes. The study highlighted the research question's policy significance, especially in light of Turkey's economic trend and the frequent discussions around "jobless growth" and productivity-led structural change. An overview of significant labor market developments, such as changes in sectoral employment, labor force participation, and demographic composition, was used to contextualize the analysis using data from the World Bank and the OECD. Building on these findings, an empirical framework was developed and the relationship between productivity and employment was studied from a variety of theoretical viewpoints to give an adequate basis for research.

In contrast to Keynesian theories, which emphasize how productivity growth through wage increases and consumption can increase demand, the neoclassical framework emphasizes capital-labor substitution and the potential labor-displacing nature of technological change (Solow, 1956). The significance of intersectoral labor movements is emphasized by sectoral and structural transformation literature (Kaldor, 1966; McMillan & Rodrik, 2011), which contends that reallocations from low-productivity to high-productivity sectors frequently account for productivity gains in emerging markets. Furthermore, contemporary research on automation and digitization (Autor, 2015) highlights how technological advancements have the dual potential to both create new job opportunities and displace specific types of labor when combined with appropriate skills policies and institutional flexibility.

A thorough literature review was included in Section 2.3 to further develop this theoretical framework. According to research conducted globally, productivity growth in advanced economies frequently coexists with stagnant employment as a result of automation and capital intensity. In contrast, structural reforms, labor market flexibility, and demographic trends affect outcomes in emerging economies (McMillan et al., 2014). Turkish research also paints a complex picture, showing that while productivity increases have coincided with economic restructuring, they have not always resulted in the creation of jobs, especially during times of financial volatility. The empirical analysis in Section 2.5, which aimed to precisely measure these dynamics using a strong econometric framework, was inspired by this literature.

The empirical strategy was described in Section 2.4, which defined an ARDL model with the employment-to-population ratio (EPR) as the dependent variable. Labor

productivity (LP) and three control variables—inflation (I), age dependency ratio (ADR), and gross fixed capital formation (GFCF)—were used to explain the EPR. In order to account for macroeconomic factors and demographic pressures, this model specification was selected to capture both supply-side and demand-side factors that affect employment. In order to provide consistent estimates of both long-term relationships and short-term adjustments, the ARDL bounds testing approach (Pesaran et al., 2001) was chosen due to its adaptability to dealing with regressors with mixed integration orders (I(0) and I(1)).

A statistically significant long-run cointegration relationship between the variables is confirmed by the empirical results in Section 2.5, where an F-statistic of 7.70 exceeds the 1% crucial upper bound. According to long-run coefficient estimates, labor productivity has a positive and highly significant impact on employment ($\beta = 0.2877$, $p < 0.001$). This finding contradicts oversimplified theories of jobless growth and is consistent with empirical research showing that, in developing and emerging markets, productivity-driven growth can create jobs when paired with sectoral upgrading and institutional support (McMillan & Rodrik, 2011; Autor, 2015). According to demographic-economic literature that emphasizes dependency ratios as a key determinant of labor market dynamics, the ADR has a negative and statistically significant effect (-2.51, $p < 0.01$), highlighting demographic constraints and the economic burden of an aging population. The Phillips curve framework (Phillips, 1958) may be responsible for the modest but significant short-term positive association between inflation and employment ($p < 0.05$). In contrast, GFCF is statistically insignificant despite being positive, suggesting that capital accumulation alone is not enough to boost employment without the addition of productivity-enhancing reforms.

The highly substantial and negative error correction term (ECT = -0.85, $p < 0.001$) indicates a quick adjustment pace of 85% per year toward long-run equilibrium after short-term aberrations. The Turkish labor market is quite flexible, as evidenced by its strong adjustment dynamic. These results are supported by diagnostic tests: the Ramsey RESET test rejects model misspecification, the Breusch-Pagan test shows homoskedasticity, the Jarque-Bera statistic validates normality, and the Breusch-Godfrey LM test finds no autocorrelation. Furthermore, structural stability throughout the study period is confirmed by CUSUM and CUSUMQ plots.

Overall, the chapter shows that, given the appropriate institutional, technological, and structural circumstances, productivity development in Turkey can actually increase employment rather than displacing jobs. This finding is consistent with other studies that show productivity as a key factor in emerging economies' ability to create jobs and achieve sustainable economic growth (World Bank, 2020). However, the significant demographic issues represented in the ADR and the modest contribution of GFCF to the explanation of employment growth highlight the necessity of comprehensive policy interventions, such as sectoral diversification, human capital development, and active labor market regulations.

In conclusion, Chapter 2 presents a comprehensive synthesis of theory, research, and sound econometric data to support the idea that labor productivity and employment in Turkey should maintain a stable and policy-relevant long-term equilibrium. According to the findings, productivity gains supported by inclusive labor market reforms, skill enhancement, and institutional flexibility are necessary for long-term employment growth in the face of demographic pressures. These observations provide a solid basis for the macroeconomic consequences and policy-focused debate in the conclusion of thesis, contributing to the existing literature on the productivity–employment relationship and offering valuable lessons for other emerging economies facing similar structural transitions.

CONCLUSION

This thesis integrates theoretical perspectives, historical labor market trends, and econometric evidence to provide a comprehensive examination of the relationship between labor productivity and employment in Turkey over the period 1988–2023. It is motivated by a fundamental and enduring question in macroeconomics and development economics: does productivity growth result in 'jobless growth,' where output expands without a corresponding rise in employment, or does it inherently foster job creation? This question is especially pertinent for developing economies such as Turkey, where the growth–employment nexus has been shaped by decades of economic liberalization, structural reforms, demographic shifts, and recurrent macroeconomic shocks.

This study demonstrated that the relationship between productivity and employment cannot be explained only through a single theoretical perspective, building upon the conceptual and theoretical foundations established in Chapter 1. Technological development and capital accumulation are the primary drivers of growth, according to neoclassical growth theory. Productivity gains raise equilibrium output and, despite the possibility of short-term worker displacement, increase long-term employment (Solow, 1956). However, Keynesian and post-Keynesian theories stress that if productivity growth is not matched by adequate aggregate demand, employment may deteriorate (Keynes, 1936; Kaldor, 1966). The productivity–employment relationship is closely linked to sectoral labor reallocation, institutional dynamics, and industrial transformation, according to structuralist and development economics perspectives (McMillan & Rodrik, 2011). However, recent studies emphasize how automation and digitalization may polarize labor markets, create new skill demands, and change wage structures (Autor, 2015). This thesis emphasizes the significance of empirical methods that take demographic factors and macroeconomic volatility into account while presenting the Turkish experience within a global discourse by combining many theoretical frameworks.

An Autoregressive Distributed Lag (ARDL) model, a powerful econometric technique, was used in the empirical study described in Chapter 2 to apply this conceptual framework (Pesaran et al., 2001). This approach was selected because it can deal with regressors integrated of different orders (I(0) and I(1)), it can simultaneously estimate

long-run equilibrium relationships and short-run dynamics, and it is very suitable for small-sample time series contexts, which are prevalent in research on emerging markets. Along with the employment-to-population ratio (EPR) as the dependent variable and labor productivity (LP) as the primary explanatory variable, the model specification included three essential controls: inflation (I), which represents the macroeconomic stability dimension of growth; the age dependency ratio (ADR), which captures demographic pressure and labor market participation constraints; and gross fixed capital formation (GFCF), which represents capital accumulation driven by investment.

Unit root tests were used to validate the ARDL framework, confirming that all variables were integrated of order one. A statistically significant cointegrating link between employment and its determinants was demonstrated by the limits test, which provided strong support for a stable long-term equilibrium. The results demonstrated that labor productivity had a positive and statistically significant influence on employment ($\beta = 0.2877$, $p < 0.01$), in contrast to the widely held beliefs that attribute productivity growth only to labor displacement. Instead, the Turkish example shows that productivity increases combined with sectoral upgrading, institutional reforms, and macroeconomic stability can have a favorable effect on labor absorption. In line with the literature on development economics, McMillan et al. (2014) claim that structural transformation can make productivity-driven growth more employment-enhancing rather than jobless.

According to Bloom and Canning (2008), the negative and highly significant effect of ADR (-2.51, $p < 0.01$) highlights the demographic constraints of the aging population and supports the idea that demographic transition affects labor market dynamics in emerging economies and that demographic policy needs to support growth strategies. Inflation and employment have a short-term positive association, according to Phillips curve dynamics (Phillips, 1958), suggesting that temporary demand pressures can boost labor absorption. The GFCF coefficient, on the other hand, was statistically insignificant while being positive, indicating that investment-led growth would not always lead to job creation in the absence of further reforms and targeted innovation initiatives. The dynamic adjustment capabilities of Turkey's labor market are confirmed by the extremely significant error correction term (ECT = -0.85, $p < 0.01$), which indicates that nearly 85% of deviations from long-run equilibrium are adjusted annually. Diagnostic tests including the CUSUM/CUSUMQ stability tests, Breusch-Godfrey LM,

Breusch-Pagan, Ramsey RESET, and Jarque-Bera examined the robustness of the estimated correlations and confirmed that the econometric specification was without errors.

These findings show that productivity growth in Turkey does not always lead to job loss; rather, its effect on labor demand is dependent upon institutional, structural, and demographic factors. This thesis makes a theoretical contribution by demonstrating that demographic variables such as ADR, which provide important insights into labor market dynamics in aging countries, benefit from explicit inclusion in productivity-employment models. Methodologically, long-term ARDL modeling provides a strong framework for researching macroeconomic links in emerging markets, solving data constraints while providing accurate estimations of both equilibrium and adjustment processes. The findings provide an empirical contribution to the worldwide literature by demonstrating that, under certain institutional and policy conditions, productivity increase and job expansion can coexist.

These findings have substantial policy implications. They first highlight the need for a comprehensive strategy to transform productivity increases into inclusive employment. Active labor market policies, industry diversification, and human capital development are required to ensure that productivity gains are not concentrated in capital-intensive businesses that generate few job opportunities. Second, the ADR's representation of demographic concerns highlights the need for specific actions to increase labor force participation, especially among women and young people, as well as changes to the social security and pension systems in order to sustain economic vitality in an aging society. Third, the short-term positive relationship between inflation and employment highlights the need of maintaining macroeconomic stability; excessive inflationary pressure might undermine productivity gains and labor market resiliency. Fourth, innovation-driven industrial strategies are necessary to reduce skill gaps, improve technology, and increase employment in high-productivity industries.

Furthermore, this study points out areas that require more research. Future studies could employ sectoral or regional disaggregation to uncover heterogeneity in productivity-employment dynamics, use panel data econometric techniques to compare Turkey's experience with other emerging economies, or incorporate automation and digital transformation measures to fully capture the impact of

technological change. Researchers would also have a better understanding of how productivity gains translate into labor market outcomes if labor market flexibility indicators and institutional quality indicators were included in productivity–employment models.

In summary, the analysis indicates that job creation and productivity-led growth are not mutually exclusive but rather depend on suitable institutional support and policy coordination. The case of Turkey demonstrates how, when combined with sound macroeconomic management, demographic planning, and innovation policies, productivity gains may act as a catalyst for fair and sustainable growth. These results provide policymakers in emerging economies with concrete insights into how to leverage productivity gains for widespread social benefits, and they also add to the worldwide discussion on the jobless growth. This paper contributes to the literature on employment and growth by combining historical context, robust econometric modeling, and theoretical accuracy. It illustrates the necessity of analyzing productivity dynamics within a comprehensive framework that considers sectoral evolution, demographic realities, and macroeconomic stability .

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APPENDIX 1: DATA SOURCES AND VARIABLE DEFINITIONS

Table A1: Data Sources and Variable Definitions

Variable	Symbol	Definition	Measurement/Unit	Source	Period
Employment to Population Ratio	EPR	Ratio of Employed Persons to Working-Age Population	%	WORLD BANK	1988-2023
Labor Productivity	LP	GDP per Hour Worked in Current USD, PPP Adjusted	Dollar	GLOBAL ECONOMY, OECD	1988-2023
Gross Fixed Capital Formation	GFCF	Gross Fixed Capital Formation to GDP	% of GDP	TRADE ECONOMICS, WORLD BANK	1988-2023
Age Dependency Ratio	ADR	Ratio of Old Population (+65) to Working-Age Population	% of Working-Age Population	WORLD BANK	1988-2023
Inflation	I	Percent Change in the	%	GLOBAL ECONOMY, WORLD	1988-2023

		Consumer Price Index		BANK	

Notes:

-Symbols correspond to those used in the econometric models.

-Sources include Global Economy Data, Trade Economics Data, OECD, and World Bank.

-Periods correspond to available annually data.

APPENDIX 2: DESCRIPTIVE STATISTICS

Table B1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
EPR	45.97222	2.999868	41.00000	52.00000	36
LP	27.20000	12.70460	13.40000	57.00000	36
GFCF	25.58034	3.271955	17.9503	31.85664	36
ADR	10.22222	1.914025	8.00000	15.00000	36
I	38.58056	31.74778	6.30000	105.20000	36

APPENDIX 3: UNIT ROOT TESTS AND ARDL BOUND TEST RESULTS

Table C1: ADF and PP Test Results (Constant)

Variable	ADF(Level)	ADF (1^{st} Diff.)	PP(Level)	PP (1^{st} Diff.)	Result
EPR	-1.768301 (0.3894)	-5.963807** (0.0000)	-1.728786 (0.4085)	-5.963807*** (0.0000)	I (1)
LP	0.085771 (0.9597)	-6.340117*** (0.0000)	-1.507827 (0.5180)	-4.857106** (0.0000)	I (1)
GFCF	-1.572346 (0.4858)	-6.364248** (0.0000)	-1.575583 (0.4842)	-6.392337*** (0.0000)	I (1)
ADR	1.573982 (0.9992)	-5.592941*** (0.0000)	2.139479 (0.9999)	-5.580209** (0.0001)	I (1)
I	-1.414793 (0.5639)	-6.043595** (0.0000)	-1.381125 (0.5802)	-6.046639*** (0.0000)	I (1)

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table C2: ADF and PP Test Results (Constant+Trend)

Variable	ADF(Level)	ADF (1st Diff.)	PP (Level)	PP (1st Diff.)	Result
EPR	-1.744997 (0.7094)	-5.891276** (0.0001)	-1.711917 (0.7246)	-5.891276*** (0.0001)	I (1)
LP	-1.643464 (0.7533)	-6.241654*** (0.0001)	-1.819678 (0.6736)	-4.886484** (0.0020)	I (1)
GFCF	-2.995889 (0.1476)	-6.318799** (0.0000)	-2.995889 (0.1476)	-6.343327*** (0.0000)	I (1)
ADR	-1.042953 (0.9244)	-6.162521*** (0.0001)	-0.845420 (0.9512)	-6.162521** (0.0001)	I (1)
I	-0.982387 (0.9337)	-4.119211** (0.0141)	-0.902835 (0.9444)	-6.131059*** (0.0001)	I (1)

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table C3: Cointegration Test Results

K	F Statistic	Significance Level	I (0)	I (1)
4	7.704925	10 %	2.696	3.898
		5 %	3.276	4.63
		1 %	4.49	6.368

Table C4: Long-Run Coefficients Variables

The Variable of Labor Productivity	Coefficient	Std. Error	t-statistic	Prob. Value
LP	0.287760	0.080716	3.565107	0.0017***
Control Variables				
GFCF	0.3431	0.234571	1.463022	0.1576
ADR	-2.513875	0.521747	-4.818183	0.0001***
I	0.044536	0.016310	2.730641	0.0122**

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table C5: ARDL (1, 2, 3, 0, 0) Error Correction Model

Variables	Coefficent	Std. Error	t-Statistic	Prob. Value
C	45.93408	6.801004	6.754014	0.0000
D(LP)	-0.040460	0.042009	-0.963118	0.3460
D(LP(-1))	-0.363016	0.069921	-5.191832	0.0000
D(GFCF)	0.167825	0.95991	1.748333	0.0943
D(GFCF(-1))	-0.018290	0.099521	-0.183780	0.8559
D(GFCF(-2))	-0.377563	0.100742	-3.747827	0.0011
ECTt-1	-0.851645	0.126216	-6.747526	0.0000***

R-squared: 0.709084 Adjusted R-squared= 0.641949 F-statistic: 10.56214(0.000006) DW= 1.750452

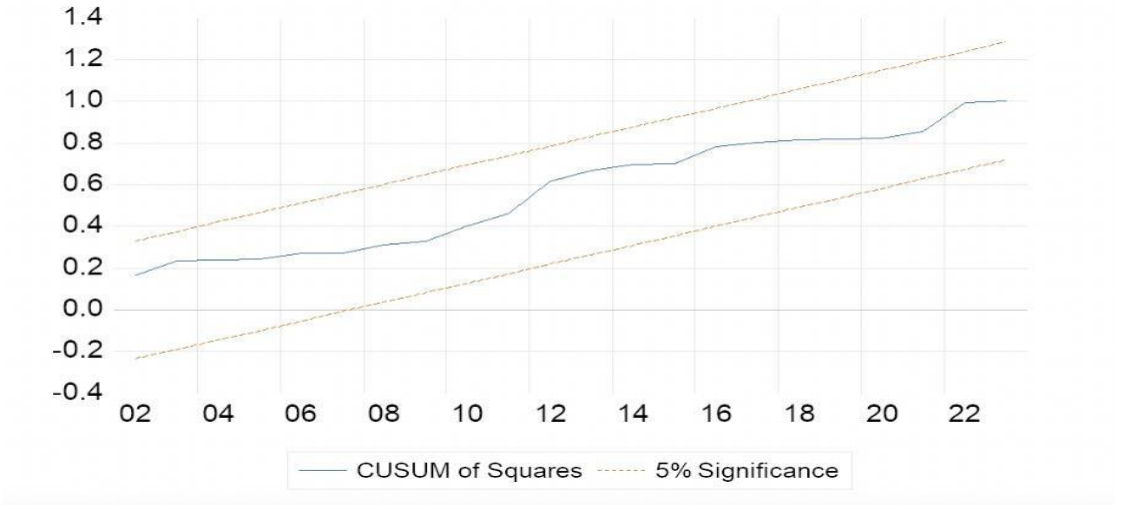
APPENDIX 4: DIAGNOSTIC STATISTICS AND STABILITY TESTS

Table D1: Diagnostic Test Results

	F-Statistic	Probability Values
LM	0.227815	0.7983
Breusch Pagan	0.396265	0.9343
Ramsey Reset	2.321035	0.1426
Jargue-Bera	0.931557 (jargue bera stat.)	0.627646

Figure 1: CUSUM Graph

Figure 2: CUSUMQ Graph



APPENDIX 5: THE FORMULA OF ERROR CORRECTION TERM ADJUSTMENT SPEED

Calculation of the Error Correction Term (ECT) Adjustment Speed

The error correction term (ECT) indicates the speed at which deviations from the long-run equilibrium are eliminated after a shock. If the ECT coefficient is equal to –α (where $0 < \alpha \leq 1$), the adjustment process can be defined as follows:

1. **Adjustment Rate (α): α** = a

This shows the proportion of disequilibrium corrected in each period.

2. **Full Adjustment Period (T): T** = $\frac{1}{\alpha}$

This formula provides the approximate time required for the system to return fully to equilibrium.

3. **Half-life ($t_{0.5}$):** $t_{0.5} = \frac{\ln(0.5)}{\ln(1-\alpha)}$

This indicates the time it takes for 50 % of the initial disequilibrium to disappear.

Application to the Estimated Coefficient (ECT = –0.8516)

- Adjustment rate: α = 0.8516 ⇒ 85.16 % of disequilibrium corrected annually

Full adjustment period: T = $\frac{1}{0.8516} \approx 1.17$ years

The system returns to equilibrium in about **1 year to 1 year and 2 months**.

- Half-life:

Approximately **9 months** are required for half of the disequilibrium to vanish (Banerjee, Dolado, & Mestre, 1998; Pesaran, Shin, & Smith, 2001).

APPENDIX 6: ETHICS COMMISSION FORM

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		Yayım Tarihi *Date of Pub.*	22.11.2023
	FRM-YL-09 Yüksek Lisans Tezi Etik Kurul Muafiyeti Formu *Ethics Board Form for Master's Thesis*	Revizyon No *Rev. No.*	02
		Revizyon Tarihi *Rev.Date*	25.01.2024

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI BAŞKANLIĞINA

Tarih: 03/10/2025

Tez Başlığı (Türkçe): Türkiye'de İş Gücü Verimliliği ve İstihdam Düzeyi Arasındaki İlişkinin İncelenmesi: Trendler ve Çıkarımlar
Tez Başlığı (Almanca/Fransızca)*: .....
.....

Yukarıda başlığı verilen tez çalışmam:

1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır.
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
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Gereğini saygılarımla arz ederim.

Pınar TÜRK

Öğrenci Bilgileri		
	Ad-Soyad	Pınar Türk
	Öğrenci No	N22139082
	Enstitü Anabilim Dalı	İKTİSAT (İNGİLİZCE)
	Programı	YL

DANIŞMAN ONAYI

UYGUNDUR.
Prof. Dr. Dilek BAŞAR

* Tez **Almanca** veya **Fransızca** yazılıyor ise bu kısımda tez başlığı **Tez Yazım Dilinde** yazılmalıdır.

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HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

Date: 03/10/2025

ThesisTitle (In English): Examining The Relationship Between Labor Productivity and Employment Level in Turkey: Trends and Implications

My thesis work with the title given above:

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

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I respectfully submit this for approval.

Pınar TÜRK

Student Information		
	Name-Surname	Pınar Türk
	Student Number	N22139082
	Department	ECONOMICS
	Programme	M.A.

SUPERVISOR'S APPROVAL

APPROVED
Prof. Dr. Dilek BAŞAR

APPENDIX 7: ORIGINALITY REPORT

	HACETTEPE ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ	Doküman Kodu *Form No.*	FRM-YL-15
		Yayım Tarihi *Date of Pub.*	04.12.2023
	FRM-YL-15 Yüksek Lisans Tezi Orijinallik Raporu *Master's Thesis Dissertation Originality Report*	Revizyon No *Rev. No.*	02
		Revizyon Tarihi *Rev.Date*	25.01.2024

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI BAŞKANLIĞINA

Tarih: 03/10/2025

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Tez Başlığı (Almanca/Fransızca)*:.....

Yukarıda başlığı verilen tezimin a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 105 sayfalık kısmına ilişkin, 03/10/2025 tarihinde şahsım/tez danışmanım tarafından Turnitin adlı intihal tespit programından aşağıda işaretlenmiş filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezimin benzerlik oranı % 21'dır.

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3. ☐ Alıntılar hariç
4. ☒ Alıntılar dâhil
5. ☒ 5 kelimeden daha az örtüşme içeren metin kısımları hariç

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

Gereğini saygılarımla arz ederim.

Pınar TÜRK

Öğrenci Bilgileri		
	Ad-Soyad	Pınar Türk
	Öğrenci No	N22139082
	Enstitü Anabilim Dalı	İKTİSAT
	Programı	YL

DANIŞMAN ONAYI

UYGUNDUR.
Prof. Dr. Dilek BAŞAR

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

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		Yayım Tarihi *Date of Pub.*	04.12.2023
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GRADUATE SCHOOL OF SOCIAL SCIENCES
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Student Information		
	Name-Surname	Pınar Türk
	Student Number	N22139082
	Department	ECONOMICS
	Programme	M.A.

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