THE IMPACT OF FREE ZONES ON STRUCTURAL UNEMPLOYMENT IN TURKEY

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ABSTRACT

THE IMPACT OF FREE ZONES ON STRUCTURAL UNEMPLOYMENT IN TURKEY

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This thesis focuses on exploring the effects of free zones in Turkey and their impact on structural unemployment. In the modern, technologically advanced economy, free zones are crucial in attracting foreign direct investment and job creation. Although the early results in Turkey were not very high, free zones were implemented in 1980 to promote export-driven development and employment.

To answer the research question on the effects of free zones on structural unemployment in Turkey, the study employs an unbalanced panel data model from 2013 to 2023. The dependent variable, structural unemployment, is obtained using the Hodrick-Prescott (HP) Filter. Important independent variables are volumes of trade within free zones, the number of firms, and the number of operating licenses. Control variables involve regional education levels, GDP, and net migration rates.

The econometric methods used are fixed effects, panel unit root tests, and generalized method of moments (GMM). Results indicate that the volume of trade and the number of running licenses have substantially reduced structural

unemployment. Conversely, the total number of firms does not make a significant difference. Education level continuously decreases structural unemployment, whereas in some models, net migration raises levels of structural unemployment.

These results confirm that structural unemployment is present, with education and regional GDP identified as robust predictors. Overall, the paper concludes that the impact of free zones in Turkey on structural unemployment is indirect yet significant. To maximize the effect of education and labor market policies, it is necessary to strengthen them.

Keywords: Free Zones, Structural Unemployment, HP Filter

ÖZ

SERBEST BÖLGELERİN TÜRKİYE'DEKİ YAPISAL İŞSİZLİK ÜZERİNDEKİ ETKİSİ

ÖZORUN, Saadet
Yüksek Lisans, İktisat Bölümü
Tez Yöneticisi: Prof. Dr. Erkan ERDİL

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Bu tez, Türkiye'deki serbest bölgelerin etkilerini ve yapısal işsizlik üzerindeki etkilerini araştırmaya odaklanmaktadır. Modern ve teknolojik açıdan gelişmiş bir ekonomide, serbest bölgeler doğrudan yabancı yatırımların çekilmesi ve istihdam yaratılması açısından büyük önem taşımaktadır. Türkiye'deki ilk sonuçlar çok yüksek olmasa da, serbest bölgeler 1980 yılında ihracata dayalı kalkınma ve istihdamı teşvik etmek amacıyla uygulamaya konulmuştur.

Türkiye'de serbest bölgelerin yapısal işsizlik üzerindeki etkilerine ilişkin araştırma sorusunu yanıtlamak için, çalışmada 2013-2023 yılları arasında dengesiz bir panel veri modeli kullanılmıştır. Bağımlı değişken olan yapısal işsizlik, Hodrick-Prescott (HP) Filtresi kullanılarak elde edilmiştir. Önemli bağımsız değişkenler serbest bölgelerdeki ticaret hacmi, firma sayısı ve faaliyet ruhsatı sayısıdır. Kontrol değişkenleri bölgesel eğitim seviyeleri, GSYİH ve net göç oranlarını içermektedir.

Kullanılan ekonometrik yöntemler sabit etkiler, panel birim kök testleri ve genelleştirilmiş momentler yöntemidir (GMM). Sonuçlar, ticaret hacminin ve işletme

ruhsatı sayısının yapısal işsizliği önemli ölçüde azalttığını göstermektedir. Buna karşılık, toplam firma sayısı önemli bir fark yaratmamaktadır. Eğitim seviyesi yapısal işsizliği sürekli olarak azaltırken, bazı modellerde net göç yapısal işsizlik seviyelerini yükseltmektedir.

Bu sonuçlar, eğitim ve bölgesel GSYİH'nin güçlü öngörücüler olarak belirlendiği yapısal işsizliğin mevcut olduğunu doğrulamaktadır. Genel olarak bu çalışma, Türkiye'deki serbest bölgelerin yapısal işsizlik üzerindeki etkisinin dolaylı ancak önemli olduğu sonucuna varmaktadır. Eğitim ve işgücü piyasası politikalarının etkisini en üst düzeye çıkarmak için bu politikaların güçlendirilmesi gerekmektedir.

Anahtar Kelimeler: Serbest Bölgeler, Yapısal İşsizlik, HP Filtresi

To My Family

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CHAPTER 1

INTRODUCTION

1.1. The Context and Aim of the Thesis

As time passed and the era changed, what was right became wrong, and what was thought to be modern became outdated under the influence of globalization. To gain a place in globalization, countries entered a competition to develop the technologies of their time and surpass those of others. This situation profoundly impacted the structures of modern economies, prompting countries to develop new policies and strengthen their competitive structures against other nations. In this context, free zones, which are the building blocks of our study, have become a popular strategy in both developed and developing countries to increase economic growth, international competitiveness, and employment opportunities within the country. The mentioned free zones attract domestic and foreign companies due to the various advantages they have (such as tax exemptions, ease of customs procedures, and infrastructure advantages). Thanks to these advantages, companies investing in countries with free zones also take their technologies and knowledge to the countries they visit, supporting regional development. In Turkey, a developing country influenced by the global popularity of free zones, export-oriented free zones began to be established in the 1980s. Currently, there are 19 free zones in Turkey, which are positioned to both advance the country's economy and address the employment problem.

Unemployment, another key building block of our study, holds a crucial position in the economic literature and is a significant criterion for assessing a country's economic and social health. Among the frictional, structural, and cyclical types of unemployment, structural unemployment is a long-term type that arises from mismatches between those who demand labor and those who supply labor in a

country's labor market. Unlike other types of unemployment, structural unemployment arises from structural economic difficulties, skill mismatches, and sectoral and geographical factors. Due to the structural nature of the situation, structural unemployment is more challenging to address than other forms, and policymakers need to conduct thorough analyses to resolve it. Turkey has a young and dynamic population in its labor market, which means that structural unemployment can have a profound impact on the Turkish economy, welfare, and development. So, can free zones prevent structural unemployment by creating the necessary demands and analyzing them correctly? The answer to this question, which we ask in our study, is of great importance both academically and politically.

In this thesis, we address the effect of free zones in Turkey on structural unemployment in Turkey. In particular, this study examined the possibility of reducing structural unemployment through the economic contributions of 19 free zones, including trade volumes, the number of firms, and the number of operating licenses. Moreover, in addition to these economic contributions, the aim was to examine the relationship between free zones and structural unemployment more comprehensively by using the education level, migration rates, and regional gross domestic product in 26 regions in Turkey as control variables. This study is designed with a quantitative research approach and focuses on the period from 2013 to 2023. We employ an unbalanced panel data model in our study due to the limited availability of data for certain years, which enables the inclusion of region-year observations even when data are missing for specific years. Structural unemployment is a type of long-term unemployment that is difficult to measure. Since it is difficult to measure, we obtained structural unemployment from unemployment data in Turkey using the Hodrick-Prescott (HP) filter in this study. Then, we applied econometric techniques, including the fixed effects model, panel unit root tests, and generalized method of moments (GMM), to examine the effect of free zones on structural unemployment. This study aims to explain not only the effect of free zones in Turkey on reducing the structural unemployment problem but also to highlight their role in enhancing the effectiveness of economic policies to be implemented.

1.2. Motivation of the Study

Every study presents an idea, just like the one we propose in this study: whether free zones have an impact on structural unemployment. In the current analysis, it is proposed to focus on the modern economic situation in Turkey and contrast it to the economic situation in a few other states in Europe. Structural unemployment is the most long-term form of unemployment and it has long-run and severe consequences to the labour force, and it promotes macro-economic fluctuations. This, therefore, means that structural unemployment is a big challenge to all countries. Figure 1 illustrates the structural unemployment rates in European countries, including Turkey. So, how does Turkey differ from its European counterparts, and what is its standing when compared to other nations?

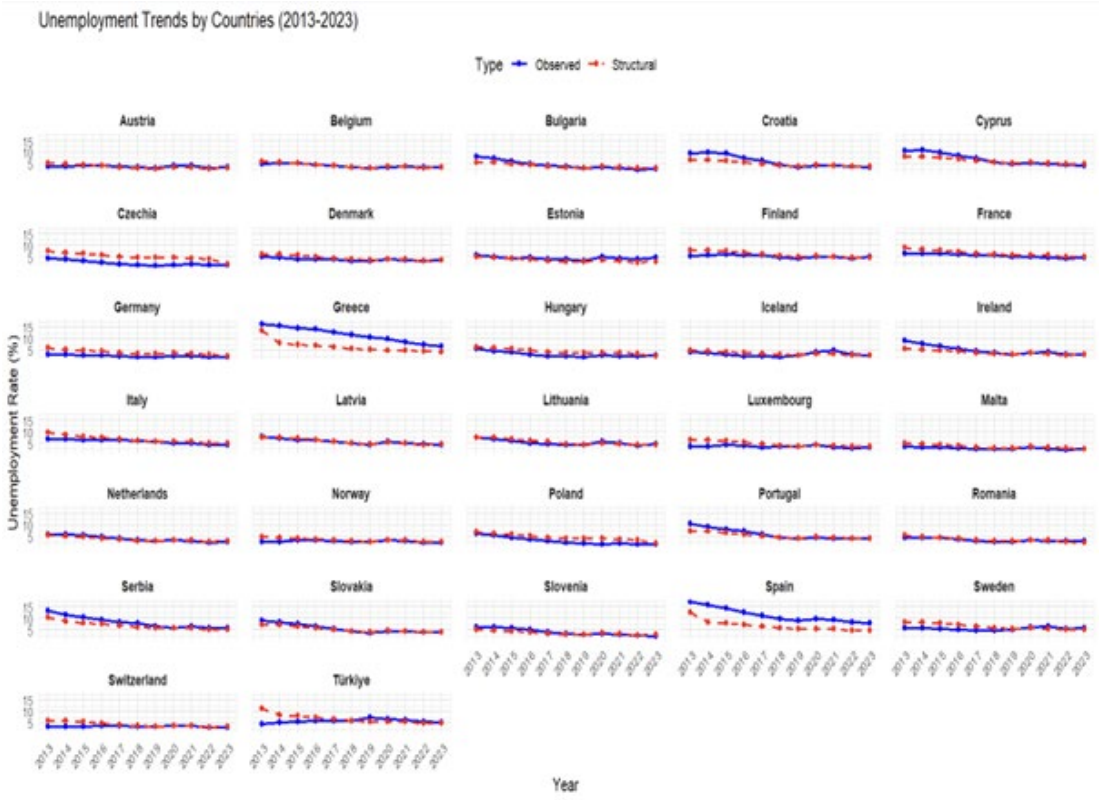

Figure 1. Unemployment Trends by Countries (2013-2023)
Source: Eurostat (2024)

As we can see more clearly from Figure 1, the course of structural unemployment in Turkey is striking compared to other European countries. When the graphs are

scrutinized, it is evident that unemployment rates in Turkey are higher than those in other countries during specific periods and that they exhibit a slower recovery than other countries in economic recovery processes or have difficulty falling below a certain base level. This situation demonstrates that the current unemployment problem in Turkey is not only related to temporary economic shocks but also that structural factors play a significant role in the persistence of the unemployment issue. The structural unemployment problem worldwide is a serious issue arising from the dynamics of the labor market. This situation also has an important place in Turkey's labor market. There are several reasons why we chose structural unemployment, one of the main characteristics of this study. Firstly, the mismatch between the level of education observed in Turkey and the demand in the labor market contributes to the unemployment problem in Turkey being more persistent compared to other European countries. For example, as the young population in Turkey increases, unemployment may also rise during the same period (TurkStat, 2024). The primary reason for this is that the skills of young graduates do not align with the changes in the sectors and the criteria demanded by these sectors. The resulting mismatch also suggests that it introduces a structural skill gap. The second reason is that the Turkish economy has undergone a transition from an agricultural to an industrial and service-based sector with globalization (TurkStat, 2023-2024). A structural transformation occurred in the country following this transition, resulting in decreased employment in some regions and sectors. Unfortunately, no adequate measures have been taken to solve the unemployment problem. Finally, Turkey's demographic structure is younger and growing rapidly because this population increases the labor force supply. However, Turkey is inadequate to meet this supply in terms of economic growth and the provision of new job opportunities. For example, when we look at Turkey's unemployment rate, even in 2019, we see that it is higher than that of other countries. This situation clearly shows us the effect of the demographic structure in Turkey on structural unemployment.

On the other hand, the fact that the female population in the country is less involved in the labor market than men and the prevalence of informal employment in the country shows that the structural unemployment in Turkey is not only quantitative but also qualitative (İlkkaracan, 2012). As mentioned before, the unemployment

problem in Turkey is structural, and this situation is critical, especially for the young and skilled. At this point, free zones, which are also gaining importance in the global world, offer the potential to be the solution to structural unemployment in terms of increasing economic growth and employment in the country. Therefore, the second building block of this study, free zones, was discussed. Free zones play a crucial role in creating new job opportunities by attracting local and foreign investors to the region and offering various support measures such as tax advantages and streamlined bureaucratic processes (Yavan, 2010). However, whether free zones in Turkey will impact structural unemployment is a matter of controversy. Therefore, one of the primary motivations of this thesis is to examine the employment creation capacity of free zones in the regions where they are located, their integration into those regions, and the compatibility of the qualifications of the existing workforce with the job opportunities to be created. As a result, the reason for choosing a topic titled 'The Impact of Free Zones on Structural Unemployment in Turkey' in this thesis is that structural unemployment in Turkey is chronic. Therefore, despite Turkey's young population, developing economy, and geopolitical location, the unemployment problem cannot be solved. The fact that unemployment trends in Turkey have remained consistently high compared to similar countries has led us to show the necessity of structural reforms and to contribute to academic studies on this subject. With this study, we will contribute to the academic literature and provide practical impact. The discussion conducted here analyzes the role of free zones in causing structural unemployment hence equipping policymakers with empirically backed information that they need to design economic policies that promote not only social welfare but also provide a sustainable development.

1.3. Content of the Thesis

This study consists of 5 sections. After the introduction section, where we talk about the purpose of the study and our motivation, we move on to the second section, where we review the literature. In the third section, we discuss the research design of our study, including data collection and the data used, the model diagnostics employed to estimate structural unemployment, the limitations encountered during the study, and the methodology section, which includes the conclusion. In the fourth

section, namely the findings section, we explained the fixed effects model and the panel unit root test results used in our study, as well as the effects of free zones on structural unemployment. We also linked our findings to existing literature at the end of Chapter 4. In the last section, a comprehensive evaluation of all the tests and research conducted is presented, demonstrating that our study can inform future studies.

CHAPTER 2

LITERATURE REVIEW

This chapter aims to examine views that will provide a better understanding of whether free zones, which play a crucial role in economic development, have a positive impact on structural unemployment, a significant risk in the labor market. In this chapter, we first examine the studies conducted on free zones worldwide and in Turkey, as well as the advantages they provide. Then, we examine the studies that address the negative characteristics of these free zones. Secondly, we mentioned the studies we examined while investigating what structural unemployment is and how it can be measured, an important topic for our study. Then, we discussed the studies conducted on HP Filter, which we use to measure structural unemployment in this study. Finally, we will finish this chapter by explaining why the reviewed studies used it.

Throughout history, human beings have struggled relentlessly to survive. In order to make their existence in this World both safe and permanent, they have constantly pushed the boundaries of innovation out of necessity or necessity. Due to increased competition brought about by globalization, investors have become more proactive in seeking out regions with low production costs and favorable incentives and exemptions. The benefits granted to investors are intended to encourage more foreign investment, boost international trade—especially in developing countries—promote the adoption of technological advancements, and stimulate innovation. Thus, the creation of the so-called 'free zones' that provide such advantages and cater to the unique needs of both developing and developed countries has been an emergent new policy (Nısfet & Hayrettin Tıraş, 2009). This initiative aims to improve a country's competitiveness relative to other nations, raise the standard of living within the country, and overcome existing bureaucratic obstacles (İmamoğlu, 2022).

Trade networks are critical for countries to do so because they create positive externalities for innovative activities for firms in free zones and increase the interconnectedness of firms in the same zone. Moreover, these trade networks increase the continuity of information exchange between firms and create various benefits by promoting cooperation synergies between regions and firms. In her study, Saxenian (2006) emphasizes that the link between free zones and the firms located in them is crucial for both existing and new firms to maintain their competitive advantage. This connection is also vital for rapidly diffusing newly designed applications and technological innovations (Saxenian, 2006).

These trade networks also effectively lower both entry barriers and production costs for entrepreneurs, optimize firms' R&D investments, and reduce the risks associated with innovation. Moreover, these trade networks not only provide economic benefits to free zones but also provide structural and institutional improvements. Through the trade networks discussed in the studies, firms in free zones are encouraged to learn from one another and to continuously innovate both technologically and managerially (Feldman, M.P., & Florida, R., 1994). The phenomenon observed among firms, referred to as agglomeration in the academic literature, indicates that firms located in free zones can increase their productivity and facilitate knowledge spillovers. This happens since firms in these clusters are near each other, so they collaborate more and end up performing better together in terms of efficiency and creativity (Porter, 1998). As a result of good trade linkages, free zones attract experienced and capable people. This helps fill skills gaps and fosters talent flow, accelerating labor upskilling and enhancing regional productivity and stability (Rodriguez-Clare A., 1996). Trade networks increase the resilience of firms in free zones, making them key players in global supply chains (Castells M., 2008). That is why the Free Zones, which encompass various models such as Free Trade Zones, Free Ports, Free Production Zones, Free Export Zones, Transit Zone, Free Cities, Maquiladora, Free Banking or Coastal Banking, and Duty-Free Shops, will be discussed within this study, have emerged in response to the widespread impact of globalization and technology on different aspects of human life and have been accepted and implemented by developed and developing countries (Rodrigue, 2020).

The concept of free cities is the first example of free zones, and it has a long and fascinating history dating back to ancient times. Scholars generally agree that the first free cities were Tire and Carthage. Among the two, Carthage played a crucial role as a transit trade center in the Mediterranean region. It was able to establish governmental dominion over a broad network of towns, ports, and colonies because of its advantageous location on the eastern and southeastern coastlines of the sea. Carthage consolidated its dominance and influenced the commerce routes in the area by requiring any ships transporting goods to its affiliates to load in their ports. Despite its importance, Carthage's people did not have complete political freedom. The policy required ships to take on cargo at British ports by force rather than at their discretion. As a result, only those merchants who belonged to RTI could use Carthage's privileges, leaving other dealers out. However, it is impossible to ignore Carthage's influence on the growth of free cities, and academics and historians alike are still interested in it. (Erdoğan & Ener, 2005). During the 3rd and 2nd centuries BC, the development of maritime transport and trade led to the emergence of significant trade hubs. These cities, which were completely detached from the wars of that era, remained neutral in international politics and focused solely on facilitating trade activities (Pirenne & Edwards, 1962). A long while later, in the 19th century, free cities emerged as free zones in America, and over time, the concept of free zones gained popularity worldwide, being widely adopted by the rest of the World in the 1930s. Free zones were used to mitigate the effects of economic downturns following the devastating economic depression of 1929. The most successful of them were Singapore and Hong Kong before World War II. Later, the establishment of free zones in various countries, including Panama, Ireland, Taiwan, and South Korea, contributed significantly to the adoption and rapid development of free zone policies worldwide (Bağrıçık, 1997). Since the 1950s, multinational corporations have played a significant role in the global economy by facilitating the international flow of production factors and technology (Paksoy & Güllü, 2011). One crucial development in this regard was the establishment of free production zones dedicated to exports, with the Shannon Free Zone in Ireland being the first of its kind in 1959 (Alansary & Al-Ansari, 2023). According to UNCTAD, the 1960s marked the emergence of modern Free Zones, which were strategically positioned close to airports, seaports, and border crossings. Because it was the first to integrate industrial

operations with the international trade tasks often associated with free ports or free trade zones, this zone has a significant position in the historical development of free zones. The establishment of these free zones has facilitated the expansion of global trade, providing companies with a means to operate internationally.

When we return to Turkey, which will form the content of this study, we encounter a situation that can be considered rich in terms of the Free Zone. Attempts to establish the first free zone in Turkey resulted in negative results (Uslu, 1985). Initially, the goal was to establish a free trade area centered on the Port of Istanbul. Later, on November 27, 1927, Ford Company Export Incorporated was founded in Ankara, at Tophane, but was located within Istanbul's customs boundaries. This establishment aimed to produce trucks, cars, tractors, and airplanes, along with their repairs and parts through assembly. An agreement was then signed to establish and operate this Free Zone. Following this condition, Turkey passed new laws in 1946 to control the export of items including furs and carpets. The new regulations published as a result of Ford's failure aimed to make it easier and more dependable to deliver goods along the highways. Unfortunately, the goal was not achieved. The passage of the Free Zone law in 1953 marked a significant turning point for Turkey because it was the largest Free Zone initiative since 1927. After the event, it was decided to establish a Free Zone, and consequently, one was set up at Iskenderun Port. Unfortunately, the desired outcome was not achieved as expected, and the free zone was abolished. The Free Zone Organization was established in 1982, and after 1983, notable efforts were made towards the creation of free zones. Thus, the first Free Zones were established in the ports of Antalya and Mersin in 1985. Since the early 1980s, Turkey has pursued an export-driven growth strategy to boost its international trade. One of the key components of this approach has been the establishment of Free Zones, which has incentivized businesses to invest in export-oriented production and has facilitated the inflow of technology through foreign direct investments (Danacı & Koçtürk, 2017). This strategy has also helped to address the issue of unemployment by generating new employment opportunities. For example, according to TurkStat data, in 2013, a total of $2,412,825 in exports and $1,267,869 in imports were recorded in Turkey's Free Zones (Çetinkaya & Bektaş, 2014). Ten years later, in 2023, when we look at the trade flow change of the Free Zones, we see that a trade of $3.869.633

was made from domestic to free zones, $12.654.597 from free zones to abroad, $9.278.102 from abroad to free zones and $5.063.350 from free zones to domestic (Turkey Ministry of Trade, 2024a). When we examine Turkey's overall imports and exports to assess the contribution of Free Zones to the economy, we can see that in 2023, exports increased by 0.6% compared to 2022, reaching $255.77 billion. Imports decreased by 0.5% to $ 361 billion 774 million (TurkStat, 2023). According to the number of free zones in Turkey, it is evident that there is a significant impact on Turkey's import and export figures. Due to various reasons, such as new employment opportunities created with the Free Zones, the total employment in the Free Zones in Turkey in 2002 was 91.303, while a total of 30 million 752 thousand people were employed in Turkey. In 2023, while Free Zone employees were 99.023, 31 million 632 thousand people were employed in Turkey (Turkey Ministry of Trade, 2024b). For the purposes that Turkey wants to achieve, currently, there are a total of 19 free zones in Turkey, including Mersin, Antalya, Aegean, Istanbul Specialized, Trabzon, Istanbul Trakya, Adana Yumurtalık, Istanbul Industry and Trade, Samsun, European, Rize, Kayseri, Izmir, Gaziantep, TÜBİTAK-MAM, Denizli, Bursa, Kocaeli and Western Anatolia (Turkey Ministry of Trade,2024a).

In many countries, free zones are designated as distinct geographical areas characterized by the application of a range of incentives and privileges not typically available in the broader national context. The incentives and privileges applied in these countries are specifically designed to stimulate interest in and co-ordinate various economic activities in free zones. Among the incentives and privileges applied explicitly to these zones are tax reductions and exemptions, exceptional infrastructure development opportunities, competitive land and property prices in the region, and efficient transportation systems that facilitate market access (Acar & Gültekin-Karakaş, 2017). Due to the incentives available in free zones, foreign investors have the opportunity to seek new markets and expand their activities. This motivation also facilitates their entry into the country. In addition to the incentives, another and one of the most important factors that attract foreign investors is the positive impact of the incentives on the economy and the competitiveness of the companies in the regions that provide such advantages. Additionally, the proximity of regional companies to one another creates a mutual interaction channel among these

companies. It enables them to learn innovations from each other more easily (Tutar et al., 2007). The concept under discussion is known in the economic literature as agglomeration economics and offers several benefits. These benefits include inter-firm knowledge transfer, access to a larger labor pool, location advantages, and lower transport costs. As a result, this economic model increases business synergies and reduces production costs (Asheim & Isaksen, 1997). For example, researchers examining the concept of regional innovation systems in Norway emphasize the importance of localized learning and regional agglomeration in promoting innovation. They also provide an empirical analysis of geographical variations in innovation activity within the Norwegian industry. Furthermore, free zones are categorized as either closed (where only some rules and regulations of the host country do not apply) or open (where the tax and customs laws of the host country do not apply at all). Since their establishment, these zones have seen significant structural and physical changes. So much so that today, such areas can emerge as technology and science parks, or they can cover an entire country or province (Acar & Gültekin-Karakaş, 2017). Countries can strengthen themselves, share advanced technology, improve their regional areas, become competitive worldwide, increase sales abroad, attract interest from foreign investors, improve the economy, and manage unemployment caused by globalization and new technologies. To achieve these goals, countries are prioritizing the establishment of free zones. Acar and Gültekin (2017) also examined the status, functioning, and economic impact of free zones in Turkey and globally, including their role in international trade and investment. They also examined successful and unsuccessful global implementations of free zones to analyze their impact on economic growth and development and to draw applicable lessons and strategies for Turkey. Developing countries are putting more focus on free zones as they aim to attract foreign investors, exchange technology, and make progress by learning new things, because the export experience and skills between richer and poorer nations differ greatly. The primary objective of this strategy is to bridge the gap between developed and developing nations, thereby supporting long-term economic growth and development. Tutar and others argue that free zones facilitate countries' adoption and utilization of new technologies while also encouraging international investment (Tutar et al., 2007). Advancements and new technologies improve people's lives by helping more

individuals secure employment and enhancing the nation's social and economic well-being. To promote innovation, we should have skilled people, a favorable environment for generating new ideas, strong means for innovation, and access to capital through free zones (Tutar et al., 2007). In addition, this type of strategy allows businesses to see innovation as a main factor in boosting their growth and revenue. Free zones come with many advantages, which explains why academics are interested in studying them. For instance, Kibritçioğlu looked at the effects of free zones on the entire economy in 1997. In his study, he made a descriptive study by using the geographical distribution of free zones, the number of free zones in the World, the total trade volumes of free zones, the share of free zones in the total trade of goods in the World, the total employment in free zones, the trade direction of free zones in Turkey, and the share of free zones in Turkey in total trade of goods. As a result of this study, his findings showed that free zones are not only established in developing countries but also contribute significantly to regional development and the reduction of unemployment problems in these countries (Kibritçioğlu, 1997). Akal (2002) conducted another study on the macroeconomic effects of free zones (Akal, 2002). According to this study, free zones increase a country's exports. Still, they can also have several negative consequences, including monopolization, smuggling, rivalry with local businesses, unequal distribution of investment, degradation of social structures, and increased pay disparity. Furthermore, in his research, Miyagiwa (1986) introduced a Hamada Model for free trade zones, using data on import substitution, primary exports, foreign investment and capital, economic growth, and free trade area and national welfare, emphasizing that the relative factor intensity within these zones plays a crucial role in determining the welfare impact associated with economic growth and foreign investment. (Miyagiwa, 1986). Additionally, Yang presents a port hinterland comparison of Taiwan's and Korea's free trade zone laws, utilizing China's import and export data to emphasize the necessity for Taiwan to update its FTZ rules in order to enhance competitiveness and support regional industrial growth.As a result of Yang's efforts, his concepts can serve as role models for other governments wanting to establish free zones. The amount of trade between imports and exports increased from 741.55 billion yuan in 2015 to 1,484.18 billion yuan in 2019 (Statista, 2024). As a result of this growth in the past four years, China's economic conditions have improved. For example, GDP,

which was $11.06 trillion in 2015, increased to $14.28 trillion in 2019 (Statista, 2024). Based on this data, it is clear that, as Wan and his colleagues stated, this region makes a positive contribution to the Chinese economy. Since free zones in Turkey have made positive economic and social contributions, numerous studies have been conducted on the subject of free zones in Turkey. For example, in 1998, Üçışık discussed the advantages and disadvantages of Free Zones in Turkey by using annual trade volumes by region and distribution of trade in free zones by country (Üçışık, 1999). In 1999, Hava evaluated free zones, particularly the Aegean Free Zone, using data on the distribution of free zone users by their fields of activity and emphasized that Turkey's delay in implementing free zone policies was a significant shortcoming (Hava, 1999). However, positive developments were observed after the establishment of these zones. An investigation into the various forms of free zones, their benefits, and their economic impact on the growth of free zones in Turkey and worldwide was conducted in 2003 by Orhan (2003). During this research, descriptive analysis was conducted using data such as the number of personnel and workers, trade volume, investment amount, employment value, GDP, population growth, and production capacity (Orhan, 2003). His analysis was primarily concerned with the advantages of the Kocaeli Free Zone. Moreover, Kocaman conducted a comprehensive study in 2007 to analyze the financial benefits of free zones in Turkey using GNP and total trade volumes of free zones (Kocaman, 2007). The study focused on developing these zones through theoretical frameworks and compared the results with similar zones in other countries. Additionally, the study explored the impact of these zones on the growth of trade volume and employment opportunities within the country. In the study conducted by Danacı and Koçtürk (2017), the effectiveness of free zones in Turkey was examined by dividing the Free Zones in Turkey into groups and comparing them with cluster analysis using the trade volume by direction in Turkey, the total trade volume of free zones, the number of enterprises in free zones, and the number of employees in free zones. In contrast, a study carried out by Öztürk et al. in 2009 using data such as exports and foreign exchange earnings in free zones in Turkey, the number of domestic and foreign companies in free zones, the amount of foreign capital in free zones, and employment in free zones, investigated the effect of free zone policies on the urban development of Turkey (Öztürk, 2013). However, their study found no significant correlation between free

zones and economic growth based on the conclusions drawn from their research. Several inquiries have been conducted into the Turkish free zones, suggesting that many of these zones are not generating sufficient revenue because they are not operating at full capacity. However, despite this negative situation, it is predicted that Turkey is among the countries that can benefit the most from the advantages that free zones can provide due to its geopolitical location (Paksoy & Güllü, 2011).

It is important to remember that free zones differ based on the particular objectives, economic conditions, and, consequently, the requirements of any country. Because free zones assist in developing a nation's economy, they have gained immense importance. An improvement in the employment situation, causing less unemployment, is generally regarded as a key sign of economic development. Free zones not only offer job opportunities on their property but also encourage the creation of new job opportunities through the companies operating there. As a result, the free zones gain from a multiplier effect that boosts the economy as a whole.

The study's second main focus is unemployment, which Hayes asserts is a critical measure of a nation's economic health. People who cannot find employment to support themselves are considered unemployed, and this can occur in three types: structural, frictional, and cyclical unemployment (Hayes, 2022). Cyclical unemployment is a kind of unemployment caused by unpredictable shifts in the economy of a country (Diamond, 2013). Especially during an economic downturn in a country, when demand for goods and services decreases, or job seekers lack suitable employment opportunities, this type of unemployment is common. Secondly, frictional unemployment occurs when people switch jobs or industries within the labor market, according to the Reserve Bank of Australia (2025). This type of unemployment is a natural and inevitable consequence of a dynamic, ever-changing economy. While job switches are necessary for the economy to function efficiently in the long run, they can create a temporary period of unemployment for individuals transitioning between jobs. Frictional unemployment refers to the period during which individuals are unemployed while searching for new positions that match their skills and experience.

Although some people face challenges when jobs are being created, frictional unemployment is generally considered a good display of a strong and active job market. It means that the market for jobs is active, which is key for boosting the economy and promoting new inventions (Reserve Bank of Australia). Structural unemployment refers to the third kind of unemployment. Herz and Rens define structural unemployment as arising from a discrepancy between the jobs available in a market and the type of workers (Herz & Van Rens, 2011). The difference, as the authors mention, could be caused by factors such as the skills required, distance to workplaces, or concerns related to safety and security, including poaching and looting in countries affected by conflict. The aforementioned discrepancy is 'structural' because it does not arise from a temporary shock on the demand side; it is a supply-side issue and has a long-term characteristic; whenever unemployment is high and long-term, it is common to think of the form of unemployment as structural (Diamond, 2013). Although structural unemployment is long-lasting, the level can change over time, for example, if the government pursues an active labor market policy to accommodate the discrepancy (Alatalo et al., 2015). There are various methods for estimating the theoretical concept of structural unemployment. Jackman and Roper proposed that the absence of structural unemployment is attained by configuring unemployment stock such that aggregate hires are maximized given existing vacancies. Using this definition and the assumptions on the modeling side, the authors develop multiple indexes that proxy for structural unemployment (Jackman & Roper, 1987). Applying a trend to the unemployment time series, Mocan outlines another method: cyclical decomposition. In this study, he constructs a regression model using inflation rate, unemployment rate, structural unemployment data for different quintiles, cyclical unemployment data for different quintiles, income shares data, real GNP data, correlations between different unemployment measures, mean squared forecast errors, changes in income shares and inflation, and Gini coefficient. As a result, according to the data obtained from the model, the cyclical component corresponds to cyclical unemployment, while the trend component represents long-term or structural unemployment (Mocan, 1999). Elmeskov and Mac Farlan (1993), unemployment rates in OECD countries, wage equations, wage shares, unemployment volatility, the labor supply curve, and mechanisms contributing to the persistence of unemployment, such as the erosion of

skills, attitudes, and employability due to long-term unemployment and an economic model was designed using semi-annual and annual data for various countries including the United States, Japan, Germany, France, Italy, United Kingdom, Canada, Australia, Austria, Denmark, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland and Turkey. This study shows a general upward trend in structural unemployment in OECD countries. Again, this study observed an increase in structural unemployment in OECD countries, rising from 3% to 6.5% between the 1970s and the 1980s, followed by a decrease to 0.5% in the early 1990s. Moreover, structural unemployment was relatively low in Japan during the 1980s. However, when examining the EFTA countries that managed to keep their unemployment rates low despite the negative shocks, an upward trend in structural unemployment was observed at the time of the study (Elmeskov & MacFarlan, 1993). According to Estevão and Tsounta (2011), the mortgage crisis that occurred in the United States in 2008 also led to an increase in unemployment, particularly structural unemployment. The main reasons for this are the housing crisis that occurred during this period and skill mismatches (Estevão & Tsounta, 2011). Housing problems and skill mismatch increased the unemployment rate in the United States between 2007 and 2010. At the end of the model run using state-level skills mismatches, skills demand and supply data, Skills Mismatch Index (SMI), education level data, sectoral employment data, industry data, housing market conditions, labor market indicators, job losses in specific sectors, unemployment rates for different population groups, historical trends in unemployment and labor mobility, the impact of the financial crisis on the labor market, Beveridge Curve data, interstate migration trends, the structural unemployment rate, outstanding mortgages, the effectiveness of business bills and subsidies, and the American Recovery and Reinvestment Act (ARRA) measures, this rate varied differently in 50 states. For example, although the increase in unemployment was significant in Florida (5.5 %) and Arizona, it was smaller in states such as West Virginia and the Dakotas. Overall, in their study, Estevão and Tsounta found that approximately 1% of the rise in structural unemployment was attributed to unexpected home crises and 0.5% to talent mismatch (Estevão & Tsounta, 2011). To prevent structural unemployment, numerous academics have conducted studies to share their views and findings on this subject. For example, François Groepe's study examines the issue of structural

unemployment in South Africa and suggests ways to decrease unemployment through sustainable growth (Groepe, 2015). Grœpe (2015) recommends enhancing the quality of education and aligning training programs with the labor market's requirements, creating a favorable environment for entrepreneurship, investing in infrastructure projects to boost economic activity, generating employment in construction and related sectors, and promoting inter-industry activities to reduce dependence on a few sectors and create employment opportunities. This study also suggests encouraging diversification and reducing regional inequalities by encouraging economic development in rural or small areas to discourage migration to urban centers (Groepe, 2015). Additionally, the study conducted by Domenech on structural unemployment in Spain shows the role of skill gaps, rigid labor markets, and different regional economic conditions. For this, encouraging investment in underprivileged regions, boosting innovation and research programs, using digital tools more, enhancing vocational courses, and therefore decreasing structural unemployment is indicated (Domenech, 2024). Additionally, it recommends that the government, employers, and unions collaborate in developing effective policies for this purpose (Domenech, 2024). Although there are few studies on structural unemployment in Turkey, Şıklar and Bari's study employs the unobserved components approach to investigate structural unemployment. This study examines the complexities arising from both long-term and short-term factors in the Turkish labor market. It also aims to reach more accurate conclusions about basic labor market trends by using various statistical methods to distinguish between structural unemployment and other types of unemployment. This study utilized data covering the period from 1987 to 2019, including information on the labor force, employment rates, labor force participation rates, economic growth rates, inflation rates, and various components of unemployment, such as real, seasonal, cyclical, and structural unemployment. In addition, the data included quarterly figures for the inflation rate, unemployment rate, import price index, and adjusted time-varying NAIRU values, utilizing the Kalman Filtering Model. (Bari and Şıklar, 2020). Although structural unemployment is generally defined as a mismatch between job and worker, some studies suggest that this may not be entirely true. In Baker’s study, it was observed that unemployment rose when companies did not need to hire workers during the recent economic recession. Based on this study, using vacancy information in

research doesn’t match what really happens in the labor market. The report also emphasizes how restrictive monetary policy and austerity measures lower economic activity, which in turn increases unemployment (Baker, 2011). Demsetz, on the other hand, used unemployment percentages, the average number of unemployed individuals per selected year, and the duration of unemployment in hypothesis testing, arguing that the situation defined as structural unemployment may be caused by economic fluctuations rather than mismatches in skills (Demsetz, 1961).

Measuring structural unemployment is not only a task in itself; it is also not possible to measure it. Therefore, in studies that require calculating structural unemployment, methods such as the non-accelerating inflation rate of unemployment (NAIRU), the Phillips Curve, and the Kalman Filter are employed to illustrate the skill mismatch between workers' skills and available job openings. In addition, the Hodrick-Prescott (HP) Filter, Baxter-King (BK) Filter, Christiano-Fitzgerald (CF) Filter, and Unobserved Component Model (UCM) are used to separate cyclical and trend components in time series data. The purpose here is that when we remove the cyclical components from unemployment, the remaining trends are interpreted as our structural unemployment. In this study, we utilized the HP Filter to estimate structural unemployment.

The Hodrick-Prescott (HP) Filter is the most widely used filter in macroeconomic analysis to separate time series data into trend and cyclical components. This filter is a simple but effective way to filter out short-term fluctuations in the business cycle and identify longer-term trends by revealing structural factors. The HP filter is also invaluable in measuring structural unemployment, in its ability to isolate persistent and underlying trends in unemployment rates resulting from deep-rooted structural problems such as skills mismatches, labor market rigidities, and demographic shifts, and in its ability to provide a clearer understanding of the countercyclical determinants of unemployment and their implications for labor market policies and reforms (Ravn & Uhlig, 2002). However, as valuable as the HP filter is, it has also been the focus of criticism due to its methodological limitations. Among these, the most prominent is its end-point bias, which leads to unreliable estimates at the beginning and end of the time series. In addition, the HP Filter depends on an

arbitrarily chosen smoothing parameter (λ) that controls the elasticity of the trend component. When applying the HP filter, λ is recommended to be 100 for annual data, 1.600 for quarterly data, and 14.400 for monthly data. However, the appropriateness of these values is still a matter of debate among researchers (Maravall & del Río, 2001). In addition, some critics believe that the HP filter may overly smooth the trend component, masking critical medium-term unemployment fluctuations that may be due to structural changes or policy measures. As a result, many researchers have begun to explore alternative methods, such as bandpass filters that facilitate a more distinct separation of specific frequency elements or state-space models that incorporate unobserved components, providing a more theoretically robust analysis of unemployment trends (Harvey, 1989). Interestingly, despite criticisms of the HP filter, it continues to demonstrate its usefulness in analyzing structural unemployment trends in different economies and periods. As an example, Blanchard and Wolfers (2000) analyzed how long-term unemployment patterns in OECD countries are affected by both economic shocks and the existing institutions of the labor market. Also, in the same way, Gomes (2021) used the HP filter to focus on labor market mismatches and persistent unemployment in the European Union, pointing out that the tool is suitable for highlighting issues that policy should manage. As well, Orlandi (2012) analyzed the main reasons behind the OECD's unemployment using the HP filter. This method proved valuable in distinguishing between structural unemployment and cyclical fluctuations, as well as in formulating effective labor market reforms. Despite criticisms of the HP filter and the existence of alternatives, the HP filter remains in use, particularly in labor market studies. This shows us that the HP filter remains a reliable tool.

Economic challenges can arise in numerous countries due to different situations. The main reason behind these issues is unemployment, since it causes economic and social shocks and results in a cycle where unemployment and struggling economy feed each other. As mentioned earlier, most countries have begun to attach great importance to the establishment of free zones to combat both unemployment and various economic difficulties. Because free zones have positive effects on employment creation, especially in sectors such as manufacturing, services, and technology (Aggarwal, 2007).Foremost, rural regions face tougher economic

challenges than other regions. According to Basu, companies will be encouraged to invest in rural areas because of the attractive offerings of free trade zones. Therefore, funneling investments into these areas helps employ people in manufacturing, farming, and the service sector. Basu argues that this strategy can support rural economic revitalization and combat unemployment in these areas (Basu, 1996). Poland's special economic zones (SEZs) were analyzed in another study. According to research, there is an increase in employment resulting from the increased economic activity in regions with Special Economic Zones (SEZs) (Mierzejewski, 2012).

In this study, we will examine the relationship of free zones with structural unemployment in Turkey. Structural unemployment arises when there are not enough capital facilities to provide jobs for everyone in the country, and people lack the necessary knowledge or skills for the available jobs. This leads to a persistently high unemployment rate in the country. On the other hand, free zones not only provide economic development opportunities but also contribute positively to employment growth.

The studies we have examined throughout our study provide important information to understand the effects of free zones on structural unemployment. In particular, the findings of Diamond (2013) and Herz and Van Rens (2011) studies show that technological improvements and labor market mismatches lead to increased structural unemployment. However, their findings also suggest that retraining programs and aligning education with current economic conjecture can alleviate this problem. On the other hand, Miyagiwa (1986) and Aggarwal (2007), important studies on free zones, demonstrate that the labor force opportunities in free zones depend on the quality of infrastructure in that region, the bureaucratic facilities provided, and regional economic conditions. Studies on free zones in Turkey have demonstrated that the local context plays a crucial role in the performance of free zones (Danacı & Koçtürk, 2017).

Finally, the studies we have reviewed have emphasized the importance of correctly separating economic data regarding the HP Filter that we use to measure structural

unemployment. Correctly separating structural and cyclical effects from each other and setting appropriate parameters is critical for accurate results when using the HP filter. All the studies we have reviewed emphasize the need for a methodologically strong approach using the data sets we will employ when examining the impact of free zones in Turkey on structural unemployment.

In general, the studies that you will see in Table 1 at the end of the literature review section and that we have examined for our study systematically summarize the studies conducted in the fields of free zones, structural unemployment, and Hodrick-Prescott (HP) Filter in the World and especially in Turkey, which constitute the theoretical and empirical basis of our thesis study. While Demsetz (1961), Diamond (2013), and Herz and Vans Rens (2011) from the studies conducted on structural unemployment examine why structural unemployment occurs, the effects of economic shocks on structural unemployment, and the mismatches in the labor market, the studies conducted on structural unemployment in Turkey are pretty limited. These studies on structural unemployment provide a theoretical framework for understanding the effect of structural unemployment on free zones in our thesis study. Another important point of our study is that while Miyagiwa (1986) and Aggarwal's (2007) studies on free zones address the provision of labor opportunities and contributions to the economic development of countries, Danacı and Koçtürk (2017) and studies on free zones in Turkey address the different performances of free zones in Turkey. On the other hand, Harvey and Jaeger's (1993) and Hodrick and Prescott's (1997) studies on the HP Filter provide a theoretical basis for the correct separation of cyclical and structural components in time series data. These studies were also referenced in the analysis of the panel data set used in our thesis study on the separation of cyclical and structural components of the effects of structural unemployment on free zones. They helped us to accurately identify long-term and short-term trends and models in fluctuations of the selected economic indicators.

The reason for examining all these studies for our study is that they empirically test the effect of regions on structural unemployment in Turkey. While all these studies used in the literature address the economic effects of free zones on the countries

where they are located, our thesis study provides a more specific context by focusing on the effects of free zones on structural unemployment in Turkey, which has been studied in this field to a limited extent. For example, while Aggarwal (2007) addressed the effects of free zones on employment on a global scale in his study, in this study, we tried to analyze local dynamics with data sets including trade volume, number of firms, number of operating licenses, and unemployment rates for Turkey between 2013-2023. Moreover, while most studies in the literature focus on a single methodology, such as theoretical models and case studies, this thesis takes a more comprehensive approach by combining multiple methodologies, including panel data analysis and the HP Filter. This situation increases the originality of our study. It provides an opportunity to understand the effects of free zones on structural unemployment in greater depth, both theoretically and empirically.

Table 1. Literature Review

Author(s), Year	Title	Aim of Study	Data	Country/ Countries	Methodology	Results
First Category: Structural Unemployment						
Acs Z. J. , et. al., 2013	The Knowledge Spillover Theory of Entrepreneurship	This study examines th knowledge spillover theory of entrepreneurship (KSTE), which suggest that knowledge-rich environments inspire business startups. It explores how information from organizations and research creates opportunities for entrepreneurs, leading t innovation and economic growth. Additionally, it connect entrepreneurship with economic development and explains the significance of entrepreneurship for the economy and society.	This study has not specifying particular data sets used for analysis.	This study has not specific country.	Theoretical Framework	As is revealed in the present study, the knowledge spillover theory of entrepreneurship (KSTE) describes th decisions that man/woman take in the context of performing entrepreneurial activities and their economic consequences. In it, knowledge spills that take place in existing organizations cause entrepreneurial opportunities which in turn bring abou economic growth because of the innovation that it spawns. In this analysis three critical determinants have been outlined to include knowledge-rich environment, impact of established entrepreneurs and conversion of knowledge into economic value which will promote regional and national development.
Alatola, J., et. al., 2015	Structural Unemployment in Selected Countries	The aim of this study is to examine structural unemployment in selected countries and t analyse the causes, effects and potential solutions to this problem.	GDP, productivity growth, inflation rates, employmer and unemployment figures labor force participation rates, wage growth trends, and various other economi indicators from countries like Sweden, Germany, Norway, Finland, Latvia, and other sources such as the Federal Employment Agency, Council of Economic Advisors, Statistics Norway, Ministry of Employment and the Economy (MEE), and more.	European Countries	Analyzing trends and patterns in economic growth, employment, and unemployment rates, utilizing statistical tools like long-term unemployment rates and structural unemployment indicators.	Structural unemployment in economic growth indicates how crises affect labor markets resulting to prolonged unemployment. It is important to attend to skill-mismatching, regional variations and policies. The fact that Germany reduced structural unemployment in the period after the reform also shows how effective the focused assistance in the form of support and education may be. The vulnerable groups continue to remain at a greater risk whereas the qualification differences have some impact in the unemployment rates. Based on economic growth and labor supply patterns, one should concentrate on policies on education, training, and labor migration as it is a case with Sweden.

Table 1. (continued)

Bari, B., Şıklar, İ. 2020	How Much Unemployment is Structural in Turkey? A Unobserved Components Approach	The aim of this study is to understand how muc of the unemployment ir Turkey is structural and to identify the causes of this structural unemployment.	The study used data covering the period of 1987-2019, including information on the labor force, employment rates, labor force participation rates, economic growth rates, inflation rates, and various components of unemployment such as actual, seasonal, cyclical, and structural components Additionally, the data included quarterly figures for inflation rate, unemployment rate, impor price index, and smoothed time-varying NAIRU values.	Turkey	Kalman Filtering Methodology	It has been observed in the study that structural unemployment in Turkey after 2011 has been witnessed and models such as Beveridge curve confirm this point.The report shows the importance of considering distinct effects of structural and cyclical ones, now noticing especially in the growth in percentage of women in the labor community. The relationship between inflation and unemployment is also considered as the inquiry even though structural unemployment cannot be separated in the development of the macroeconomic policy. An action of this twin emphasis adds the core contribution to the contemporary economics.
Basu, A. K., 1996	Unemployment Reduction in the Presence of a Rural Based Free Trade Zone Some Policy Implications	The aim of this study is to examine the reductio of unemployment in the presence of rural-based free trade zones and to evaluate the policy implications of this situation.	Theoretical Paper	World	General Equilibrium Mod	This study finds that subsidies to establish a rural-based FTZ reduce unemployment but worsen national income since the urban sector is more capital-intensive. It shows that a rural FTZ does not increase unemployment contrary to some views. Additionally, more intervention in urban or rural areas helps reduce urban unemployment after FTZ establishment. Finally, increasing subsidies and lowering tariffs on urba goods reduce unemployment.
Blanchard, O., & Wolfers, J., 2000	The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence	This paper aims to explain the heterogeneity of unemployment in Europe since the 1960s using 20 OECD countries. It explores tha role of economic shock and labor market institutions, highlightin their interaction.	Unemployment Rates, Total Factor Productivity, Real Interest Rates, Labor Demand Shifts, Unemployment Insurance, Employment Protection and Unionizaiton.	European Countries	Panel Data Model	Unemployment in Europe rose from 1.7% in the 1960s to 11.0% in the 1990s. Declining productivity growth and weaker institutions led to higher unemployment. Models including shocks and institutional factors explai these trends. Improving labor market institutions and addressing adverse shocks can reduce unemployment.
Demsetz, H. , 1961	Structural Unemployment: A Reconsideration of the Evidence and the Theory	This paper is a re-evaluation of the theories/evidence of structural unemployment and how it can be analyzed not only in terms of the nature but also its causes and consequencesThe paper at hand pursues the goa of coming up with a comprehensive model, which will be able to fil the existing theoretical gaps. The economic implications to the leve of a certain number of unemployed people as well as the focus on the effects of structural change and of a technological innovatio that are given as the policy-relevant recommendations in the given analysis are focused.	Estimated 1960 and actual 1957 unemployment rates. Percentage distribution of unemployment for months with unemployment rates between 5 and 7% 1949-60, Unemployment percantage average numbers of unemployed / selected years and months (seasonally adjusted) , Estimated percentage rates of structural unemployme 1957 and 1960.	United States	Hypothesis Testing	Structural unemployment occurs due t low productivity expectations and wage floors. Minimum wage laws affect wage consistency with productivity, delaying job finding. To prevent it, focus on increasing worker productivity, retraining, or flexible wages.
Diamond, P.A. , 2013	Cyclical Unemployment, Structural Unemployment	The aim of this study to provide a deeper understanding of the causes and consequences of types of unemployment and t contribute to the development of strategies that can be used to combat unemployment.	Employment, unemployment, and nonparticipation trends; flow differences; unemployment rate impacts; recession and recovery shifts; mismatch measures by industry/occupation; sectoral worker movements; reemploymen rates; matching function efficiency; decline causes; effects of extended unemployment benefits an house lock on mobility; data from BLS, JOLTS, CPS, establishment- level, multi-state pilot, industry-level, and Corporate Executive Board surveys.	United States	Analyzing employment, unemployment, and nonparticipation flows to understand their impact or the Beveridge curve, especially during recessions and recoveries. Investigating nonparticipation's effects on the unemployment rate through counterfactual scenarios, assessing reemployment experiences and reviewing various dat sources to study cyclical and structural unemployment trends.	In the research, it was concluded that there is complexity in the analysis of structural and cyclical unemployment. Findings involve methodological issues, efficiency changes, permanent changes in structure and unresolved problems such as continued unemployment benefit. It brings to the fore the topic of implicit meanings an MA deals with the flow of labor markets, the beverage design changes, matching ineffectiveness, reemployment figure, data sources an research significance to economy rationale of state of unemployment an policy consequences.

Table 1. (continued)

Elmeskov, J. , MacFarlan, M. , 1993	Unemploment Persistence	This study examines th causes and consequences of persistent unemployment, exploring why it remains high and its economic effects. It analyzes structural factors and economic shocks to enhance understanding of unemployment dynamics and develop policy recommendation to reduce rates.	Unemployment rates in OECD countries from 196 to 1990, wage equations, time-series properties, unemployment volatility, panel data evidence, trend indicators like NAWRU, Beveridge and Okun curves, actual/trend rates for the US, Japan, EC, and EFTA, labor demand, wage-setting, labor supply persistence mechanisms (e.g., skill erosion), wage bargaining impact, capital shortages, data for various countries, and semi-elasticities of real wage growth related to unemployment rates.	Various OECD Countries	Among the methodologies applied to the study was a econometric analysis, which incorporated labor demand, wage-setting as well as labor-supply in investigating unemployment persistence It estimated work wage equations to review the correlation between the ris in wage and the levels of unemployment in differen countries. Dynamics and trends in selected OECD countries in relation to unemployment rates were comprehended with the help of the augmented Dickey-Fuller test.	The elements that cause high unemployment rate to include structural situations, slugging labor market adjustments and hysterisis, which influences the creation of wage and real wages development. Structural solutions to these problems and sound macroeconomic policies ca resolve the problems. The re-integration of the unemployed into the workforce is quite crucial and there is need to conduct more research and establish the cause of the same and develop policy recommendations therein.
Estevão, M.M., Tsounta, E. , 201	Has the Great Recessio Raised U.S. Structural Unemployment?	This study examines whether the Great Recession of 2008-200 increased structural unemployment in the US. It investigates the recession's effects on long-term unemployment and whether rates will remain high, using economic data and indicators to assess potential structural changes in the labor market.	State-level skill mismatches, skill demand and supply data, educational attainment, sectoral employment, housing market conditions job losses, unemployment rates, labor mobility trends financial crisis impact, foreclosure rates, Beveridge Curve data, migration trends, structura unemployment, job bills, ARRA measures, policies for structurally unemployed, econometric evidence, GDP changes, skill mismatch indices, an alternative measures of state-level GDP growth.	United States	The study used an econometric model with panel data for all U.S. states and D.C. from 1991 to 2009. To address endogeneity, it applied an Instrumental Variables approach and regression analysis, incorporating dummy variables and time effects. The study included robustness checks, interaction analysis between housing conditions and skill mismatches, alternative model specifications, and examined shocks in sectoral dispersion affecting unemployment rates.	The U.S. labor market has suffered a lot due to the financial crisis; this has resulted in upstream and downstream consequences in the job market. Some of the cause of the escalating unemployment and structural unemployment is the occurrence of skill gaps and the situations in the housing market. The pressure in the housing market should be dealt with b the government, the number of foreclosures should be reined by the government and the long-term unemployed person should be helped with the help of policy measures. Wha has been learnt by the research is that there exists a powerful bidirectional interrelation among the gap in skills, the housing services and structural unemployment and that each of them needs particular intervention activities
Groepe, F., 2015	South Africa's Structural Unemployment Challenge- The Most Important Issues to be Addressed to Place South Africa on a Sustainable Growth Path in an Effort to Reduce Unemployment Levels	This study aims to address South Africa's structural unemployment problem by highlighting key issues for sustainable growth and reducing unemployment rates. It seeks to identify the roo causes and provide policy recommendation and strategies for solving this issue.	14th UASA South African Employment Report, ASGISA (2006), National Development Plan (2012), Medium Term Strategic Framework (2014-2019), South Africa's economic growth, unemployment, inflation, inequality, challenges in NDP (education, infrastructure, spatial patterns, disease burden, public services, corruption, societal division), Employment Tax Incentive Act (2013), and 2015 e-portal for government tenders.	South Africa	Qualitative Analysis	The structural unemployment, poverty and inequality problems affect South Africa. To deal with these there should be sustained economic growth, creation of jobs and National Development Plan and Medium Term Strategic Framework policies. There i need to work together with government, private sector and stake holders. The paper shows opportunitie presented by entrepreneurship, growth of infrastructure, and weaving with African economy so as to enhance growth and diminish unemployed persons. It is hopeful that it can conquer these problems through appropriate measures and initiatives o every sector.
Herz, B. , Van Rens, T. , 2011	Structural Unemployment	This study examines structural unemployment, its causes, effects, and solutions. Caused by economic and technological changes, arises from labor marke mismatches. The study addresses its dynamics, impact on economic growth, and labor market policies to reduce it. Herz and Van Rens analyze the labor market's response to structural changes and matching workers' skill with employers' needs.	Data from the CPS (BLS) and NIPA (BEA) included wages, job-finding rates, profits, worker- finding rates, deflators, unemployment benefits, vacancy costs, discount rates, and matching function elasticity. The study analyzed worker and job mobility, wage bargaining curves, structural unemployment due to mismatch, its cyclicality, sources, adjustment costs, labor market condition differences between states and industries, and their effect on unemployment.	United States	The study used regression analysis, Bellman equations, and statistical models to estimate adjustment costs, analyze cyclical structural unemployment, and decompose its sources. Th specific econometric mod was not mentioned.	Adjustment costs are high, primarily due to wage bargaining, contributing t structural unemployment. Structural unemployment fluctuates less than overall unemployment because of limited job-finding rate concavity. Detailed submarkets reveal more structural factors. Reducing adjustmer costs may not lower unemployment but can significantly improve welfare.
Karšay, A. , 2021	NBS Working Paper Nr 1/2020	This study aims to uncover the primary factors contributing to the decrease in unemployment rates in Slovakia and the other V4 Central European nations (the Czech Republic, Poland, and Hungary) during the recovery period following the crisis fro 2014 to 2019.	Unemployment Rate, NAIRU, Output Gap, Economic Sentiment Indicator, ALMP Expenditure, Tax and Social Contribution Burden, Unit Labour Cost Nominal Compensation pe Employee, Net Unemployment Benefit Replacement Rate, GDP per Capita (PPP), Population 15-64%.	Slovakia, with some extent of analysis also covering the other V4 Central European countries, which include the Czech Republic, Poland, and Hungary.	Fixed Effetcs Panel Regression Model, Arellano- Bond Estimator, Cointegration Tests, and Robustness Checks	According to this study, the unemployment rate in Slovakia decreased significantly by both structural and cyclical factors from 14.2% in 2014 to 5.8% in 2019 , reaching a historical minimum, active labour market policies caused to increased spending and efficiency in ALMP contributed to the reduction in structural unemployment. Moreover, an overall increase in labour productivity supported higher employment and lower unemploymen rates.

Table 1. (continued)

Mocan, H.N. , 1999	Structural Unemployment, Cyclical Unemployment, and Income Inequality	This study analyzes relationships between structural and cyclical unemployment and income inequality. It investigates how economic recessions an structural changes affec unemployment rates an income distribution. Mocan explores how different economic periods influence unemployment types and shape income inequality.	Inflation rate, Unemployment rate, Structural unemployment data for different quintiles Cyclical unemployment data for different quintiles Income shares data,Real GNP data, Correlations between different measure of unemployment, Mean squared forecast errors, Changes in income shares and inflation, Gini coefficient.	United States	Regression Model	Recent econometrics better represent income shares and inflation trends. Structural unemployment raises top quintile income, inflation affects inequality progressively, and unexpected inflation benefits lower quintiles. Researchers recommend policies to reduce long-term unemployment and improve income distribution.
Second Category: Free Zones						
Acar, S., Gültekin Karakaş,D., 2017	Dünyada ve Türkiye'de Serbest Bölgeler	The study will examine the status, functioning, and economic impact o free zones in Turkey an globally, their role in international trade and investment, and their effect on economic growth. It will also explore global implementations to draw lessons and strategies for Turkey.	Development of Export Processing Zones in the World, Employment in Free Zones	Turkey, and th World	The research employs a multidisciplinary research involving such methods as econometric modeling and case studies to examine th economic and trade significance of free zones. is full of learning about th success rate of free zones, free zones and its role in trade, and economic implication by incorporating the literature review, data analysis as also the policy analysis in delivering the information and recommendations respectively.	The role of Free Zones in the world and in the Turkey is elaborately described in the paper as a capital developer. It makes the conclusion tha the Free Zones have the potential minor positive effects in the short run: the costs exceed the benefits. No transfer channel of technology exists and this fails to improve quality of labour as well as it also fails to create too many jobs. The aim of Free Zones in Turkey is to attract foreign capital though it has not been able to attain its mandate of development.
Aggarwal, A., 2007	Impact of Special Economic Zones on Employment, Poverty and Human Developme	This study analyzes the impact of special economic zones (SEZs) on employment, poverty, and human development. It assesse SEZs' role in economic development and their contribution to social and economic indicators.	The study examines the employment and human development effects of SEZs in Asia, Latin America, Africa, and Central America. Data includes employment effects, wages, working and living conditions, skill spill-over, sectoral export patterns in India, and survey data. It also uses research papers and tables from ICRIER to provide insights into labor conditions, satisfaction, living conditions, transpor health, and labor attrition within SEZs.	India	The methodology involves data collection through surveys and interviews in specific SEZs, analyzing labor conditions, wages, technology transfer, and sectoral patterns. It aims to provide policy recommendations and assess SEZs' impacts on human development, poverty alleviation, employment, technology transfers, and economic growth.	It is noted in the work that the SEZs in India have a collective effect on working conditions, the degree of satisfaction with the amount of income, and the benefits of social security as this presupposes higher levels of wages, social security, and transfer of technologies. SEZs bring into the world employment, FDI and economic growth. Some sort of ongoing check up is necessary and the policy then should concentrate at increasing the capacity of an individual, transfer of technology and upgradation of working environment so that human development and poverty reduction can be achieved.
Alansary and Al-Ansar, 2023	Defining 'Free Zones' : A Systematic Review o Literature	The aim of this study is to systematically analyse the literature review conducted to clarify the definition an conceptual framework of free zones.	Number of special economic zones, volume o maritime trade, SEZ's generations	World	Systematic Literature Review	Free zones boost economic development and investment. This study highlights the need for ongoing evaluation of regulatory frameworks, incentives, and infrastructure. It addresses challenges before 2019, UNCTAD's contributions, future research opportunities, historical context, study limitations, and Free Zone dynamics for sustainability.
Asheim, B. T., Isaksen, A., 1997	Location, Agglomeration and Innovation: Towards Regional Innovation Systems in Norway?	The aim of this study is to analyse how regional innovation systems hav developed in Norway and how geographical location, agglomeration and innovation interact in this process.	Innovative manufacturing firms in five area-types, Innovative firms in industrial agglomerations.	Norway	Theoretical and Empirical Analysis	The article is characterized by the emphasis of the creation of a difference between regionalized and embedded system with a reference to the regional development on the basis of innovation and other policies which are adaptative. It gives reference to th successful manufacturing industry of Norway and how the national governments are able to assist in encouraging development in the less developed regions through providing development with the use of infrastructure, R&D and the educatior
Audretsch D.B. & Feldman M.P., 2004	Knowledge Spillovers and the Geography of Innovation	This study examines geographic factors affecting knowledge spillovers, innovation, and economic activity. I highlights the role of knowledge spillovers in industrial clustering and economic success, as well as entrepreneurship's contribution to these processes.	Innovation Output Data, R&D Expenditures, Patent Data, Geographic Data, Employment Data, Industry Data	United States	The econometric model employed in this study primarily focuses on the knowledge production function and incorporates spatial dimensions.	Geography significantly influences innovation. Spatial context in models shows more effective connections between knowledge inputs and innovative outcomes when examining geographic units. This helps understand clusters and agglomerations where spillovers occu More research is needed on spillover mechanisms and their effects on economic growth.

Table 1. (continued)

Castells M., 2008	Globalisation, Networking, Urbanisation: Reflections on the Spatial Dynamics of the Information Age	This study examines spatial dynamics in the global network society, focusing on connection between major metropolitan areas and marginalized locations. It highlights how technological advancements influence urbanization and the ris of polycentric regions.	Utilized a stream of research	Not specific country, but examples data were used fron U.S. Europe and China	Descriptive Analysis	The research finds that early 21st-century urbanization features polycentric metropolitan regions linked by global networks. These regions combine urban, agricultural, and natural areas, driven by advanced services and communication technologies. Connectivity and local-global interplay shape urbanization patterns.
Çetinkaya, Ö., Bektaş, N.B., 2014	Serbest Bölgeler ve Ekonomik İşlevleri Yönüyle Değerlendirilmesi	The aim of this study is to analyse and evaluate the economic functions of free zones in detail.	Total exports and imports in Turkey and the Free Zones, employment in the Free Zones, exports from and imports from the Free Zones	Turkey	Descriptive Analysis	The study concludes that Free Zones can reduce unemployment and positively impact Turkey's economy. However, they don't significantly clos the balance of payments deficit through foreign exchange earnings, and their share in Turkey's foreign trade volume is low.
Danacı, T. , Koçtürk, O. M., 2017	Türkiye Serbest Bölgelerinin Kümelem Analizi ile Karşılaştırılması	This study aims to analyze the similarities and differences among free zones in Turkey regarding performance, economic contribution, and labor force. It seek to provide detailed insights into their effectiveness, efficiency development areas, and strategic recommendations for improvement.	Trade volume by direction in Turkey, the total trade volume of free zones in Turkey, the number of enterprises in free zones in Turkey, the number of employees in free zones in Turkey	Turkey	Cluster Analysis Methoaims to provide detailed insights into their effectiveness, efficiency, areas for developmentd	The study categorizes Turkey's free zones into four groups based on data, with similar characteristics within eac cluster. The Aegean free zone, having more data, forms its own cluster. The study concludes that import activities should be minimized, and export transactions maximized.
Feldman M.P. & Florida R. , 1994	The Geographic Sources of Innovation: Technological Infrastructure and Product Innovation in the United States	This study investigates the geographic origins of innovation, focusing on the link between product innovation and technological infrastructure, including company clusters and R&D. I evaluates if areas with strong infrastructure have higher innovation levels.	1982 census of Innovation Citations, Patent Counts, R&D Expenditures, High-technology Employment Data, Value Addeed in Related Industries, Receipts from Specialized Business Services, Sales of Fortune 500 Firms, State Population	United State	Recursive System of equations estimeted using Three-Stage Least-Squares (3SLS) regression.	Cluster of innovation is present in regions of high technological infrastructure, which entails presence of related industries, research and development within an industry, university research and business suppliers. These clustering add on to both the innovative potential and to the regional potential and generate competences on both technologies and industries.
Freeman C., Soet L., 2009	Developing Science, Technology and Innovation Indicators: What We Can Learn From the Past	The study analyzes the long-term evolution of STI indicators, focusing on R&D metrics. It examines changes in boundaries and attributes over four decades, challenges, an misapplications. It highlights the consequences for publi policy and the private sector and emphasizes the need for ongoing enhancement and evaluation of STI measurement frameworks.	Historical data and Survey conducted by OECD, National Science Foundation (NSF).	This study has not specific country.	Qualitative and Interpretiv Analysis	As it is noted in the paper, the STI system is changing rapidly and this implies that previous indicators might not be appropriate. It serves to emphasize that measurable systems of STI must constantly be improved and intensely judged in order to ensure that they are out of date. Identification of these constraints and dangers of such indicators in the face of the economic and technological changes experienced in the world today has also been along the line of emphasis of the paper.
Gereffi G. et. al., 2005	The Governance of Global Value Chains	The paper provides a conceptual framework of what guides the governance of global value chain by pinpointing three issues that is, transaction complexity, codifiability, and supply base capabilities. It comes up with five types of governance which are hierarchical, captive, relational, modular and market an comments about how a effective tool of policy can be established to bring about a better industry and a developed economy.	This study has not specifying particular data sets used for analysis.	This study has not specific country.	Theoretical and Comprehensive Analysis	The research finds that transaction complexity, codifiability, and supply base capabilities shape global value chain governance, which can be market-driven or hierarchical. Understanding these factors aids polic development for industrial growth and job creation. Global value chains are dynamic and require both local and global analysis.

Table 1. (continued)

Hava, H. T., 1995	Serbest Bölgeler ve Ege Serbest Bölgesi: Bir Durum Değerlendirmesi	The study examines the economic and commercial effects of free zones, focusing on the Aegean Free Zone's performance, functioning, advantages disadvantages, developments, and issues to provide strategic recommendations for economic development and international trade.	Distribution of Free Zones and Aegean Free Zone Users According to Their Fields of Activity	Turkey	Literature Review & Descriptive Analysis	The results of the study show that the Aegean Region is successful in terms of trading and production, although it has not reached its full capacity. After the establishment of this region, it has become a successful region in Turkey by attracting foreign investors to the country and the added value created in production. On the other hand, in this study, it has been reached the idea that financing long-term loans for the companies that want to operate in ESBAŞ can positively affect these companies and increase its importance among other free zones in Turkey.
İmamoğlu, İ.K. ,2019	Serbest Bölgelerin Ekonomideki Etkinliği: Türkiye'deki Serbest Bölgeler Üzerine Bir Değerlendirme	The study analyzes the economic contributions advantages, and challenges of free zones in Turkey. It evaluates their performance and impact on the economy, discussing their contribution to the economic structure and suggesting improvements for increased effectiveness.	Exports and imports by free zones, their share in foreign trade, foreign trade balance, annual trade volumes, changes in trade volume, trade distribution by countries and sectors, activity licenses distribution, and employment trends in free zones.	Turkey	Literature Review & Descriptive Analysis	Free zones in Turkey aim to boost investment, exports, foreign currency, capital, technology inflows, and employment. While they contribute to exports, they have less impact on the overall economy. The study highlights the need to address challenges and enhance their role.
Kibritçioğlu, A., 1997	Serbest Bölgelerin Olas Makroekonomik Etkile ve Bazı Düşündürdükleri	The research of Kibritcioglu examines the Turkish economic impact of free zones with the positive and negative evaluation of it It evaluates their effects on economic performance, employment, balance o trade and stability and provides essential information to the policy makers as well a other stakeholders.	Geographic distribution of Free Zones, Total number of Free Zones in the world Total trade volume of free zones (US dollars in trillions), Share of free zones in total world merchandise trade, Total direct employment in free zones, Annual trade volume and direction of trade of Turkey's free zone (1988-97), Share of Turkey's free zones in tota merchandise trade (1988-95)	World & Turkey	Literature Review & Descriptive Analysis	In this study, it is concluded that the free zones established both in Turkey and in developed and developing countries of the world contribute to regional development and also have a effect on reducing unemployment.
Kocaman, Ç. B., 2007	Serbest Bölgelerin Makroekonomik Etkilerinin Değerlendirilmesi: Türkiye Örneği	The study analyzes the macroeconomic effects of free zones in Turkey, focusing on their impac on exports, foreign investments, and economic growth. It evaluates their performance and contribution to trade balance, employment, investment, tax revenues, and overall economic structure.	GNP, total trade volume o free zones in Turkey	Turkey	Literature Review & Descriptive Analysis	Although free zones in Turkey are considered to be successful, according to this study, free zones in Turkey hav not made a significant contribution to the increase of trade and employment creation in the country.
Mierzejewski, D.J. , 2012	Influence of Special Economic Zones on Unemployment in Poland	The study analyzes the effects of special economic zones (SEZs) on unemployment in Poland, assessing their impact on unemployment rates, economic development and employment creation potential, alon with the direct and indirect effects on the labor market.	Reports on the impact of special economic zones on the labour market, including public aid, tax exemptions, investment grants, unemployment rates, employment dynamics and total numbe of employees in special economic zones, number o jobs created in different zones, investment costs, concerns about the enclav effect.	Poland	Descriptive and Analytical Method	Special economic zones created over 241,000 jobs, with growth outpacing the national average. They played a key role in job creation and regional development but also had potential enclave effects and costs. The study highlighted their positive labor marke impact and the need to distinguish genuine changes from coincidental investment attractiveness.
Miyagiwa, K. F., 1986	A Reconsideration of the Welfare Economics of a Free-trade Zone	The paper re-evaluates the effect of free trade zones on welfare economics, how they ar in operation and the economic implication o free trade zones in term of competitiveness, efficiency in production income distribution and general welfare of the economy..	Import Substitution, Primary Export, Foreign Investment, Foreign Capital, Economic Growth National Welfare with Fre Trade Zone	Less Developed Countries (LDCs) For example; Taiwan, South Korea, Singapure, Hong Kong)	The Hamada Model is a hybrid framework combining elements of the Ricardo-Viner and Heckscher-Ohlin models.	If the subsidy ratio for industry 3 (FTZ) is smaller than the ratio of export subsidy effects on the outputs o goods 2 and 3, establishing an FTZ in a tariff economy increases national welfare, regardless of the new industry's factor intensity. However, factor intensity is crucial for assessing the effects of factor growth on nationa welfare.

Table 1. (continued)

Nısfet, U. , Tıraş, H. , 2009	Serbest Bölgelerin Ekonomik Etkileri: Kayseri Serbest Bölgesi için bir Uygulama	The aim of this study is to evaluate the economic performance of Kayseri Free Zone and analyse its effects.	The analysis includes Activity Start Day, Land Condition, Infrastructure Builder, Area (m²), Total Employment in Free Zones, Working Areas in Free Zones, Trade Volume Distribution of Türkiye Free Zone Trade Volume by Trade Direction, Employment in Kayseri Region, and Trade Volume in Kayseri Region.	Turkey	Collective Evaluation of Data	The survey identified practical and structural problems in Free Zones. Proposed solutions include preventing Free Zones from becoming trade centers, encouraging production and exports, reducing dependence on foreign inputs, maintaining competitive advantages by lowering company costs, and controlling excess bureaucracy.
Orhan, A. , 2003	Serbest Bölgelerin Sağladığı Avantajlar: Kosbaş Örneği	The aim of this study is to examine the advantages provided by free zones and to explain how these advantages are realised through the example of Kosbaş.	The analysis includes the number of personnel and workers, trade volume, investment amount, employment value, GDP, population growth, and production capacity.	Turkey	Descriptive Analysis	As industrialization grows in Türkiye and the Marmara Region, Kocaeli's importance rises. Located centrally in the transportation network, it is set to become an economic and trade hub. The Free Zone will boost production and create jobs, addressing unemployment.
Öztürk, L. , 2013	Serbest Bölgelerin Geleceği: Türkiye açısından Bir Değerlendirme	The aim of this study is to examine where free zones in the world and in Turkey will evolve in the future with globalization.	Export and foreign exchange earnings in free zones in Turkey, number o domestic and foreign companies in free zones in Turkey, amount of foreign capital in free zones in Turkey, employment in fre zones in Turkey	Turkey	Literature Review & Descriptive Analysis	The number of free zones in Turkey is increasing due to the incentives applied in free zones. However, due to the privileges applied in these zones recently, the expectations of domestic companies for free zones are not met and the attractiveness of the applications is decreasing.
Paksoy, S. , Güllü M., 2011	Serbest Bölgeler Üzerine Bir Araştırma: Gaziantep Örneği	The aim of this study is to examine the Gaziantep Free Zone, which is one of the important Free Zones in Turkey due to the positive contributions o the Free Zones to the economy.	The survey covers the establishment periods, activity fields, activity types, employee numbers, legal structures, quality standards, e-commerce status, product markets, customer profiles, export and import countries, trade changes, managers' education and titles, and operating license durations of participating companies.	Turkey	Literature Review & Questionnaire	It is concluded in the study that there are great economic prospects of Gaziantep free zone in the GAP regio to Turkey. Companies will not need to worry much because of legal regulations and less bureaucracy and prosperity will be enhanced in the economy.
Porter M. E , 199	Clusters and Competition	This study investigates how clusters enhance competitiveness of companies, governments, and institutions globally. It analyzes how geographic proximity boosts productivity, innovation, and new enterprises, and explore effects on corporate strategies, policies, and economic growth	This text includes case studies and examples from different regions and sectors, such as the medica devices cluster in Massachusetts, the golf equipment cluster around San Diego, and the telemarketing cluster in Omaha, Nebraska.	The study was not conducted for a specific country, but it includes examples and case studies from United States, Italy, Germany and Portugal.	Cluster Identification, Dat Collection & Analysis	Clusters of related businesses enhance competitiveness, productivity, and innovation by providing specialized resources and synergies. They foster new businesses and creativity, with location boosting a company's competitive edge. Developing clusters should be a priority for sustainable economic growth.
Rodriguez- Clare A. , 1996	Multinational, Linkages and Economic Development	The study clarifies backward and forward linkages of multinationals and their impact on economic development, focusing on linkages in host nations, particularly developing economies. It analyzes beneficial o harmful outcomes and examines multiple equilibria influenced by multinationals.	Does not specify the use o any empirical data.	This study has not specific country.	Theoretical Model	The study finds that multinationals' impact on economic growth in host nations depends on their connections. High linkage coefficients boost local productivity and wages, while low ones hinder progress. Policies should consider these factors to maximize positive effects.
Tutar, F. , et. Al. , 2007	Firmaların Yenilik (İnovasyon) Yaratma Sürecinde Serbest Bölgeler : Kayseri Serbest Bölgesi Örneği	The aim of this study is to understand the role o free zones in the innovation creation process of firms.	Total closed, saleable and parcel area of Kayseri free zone, distribution of companies in Kayseri free zone according to their activities, foreign trade volume of Kayseri free zone, infrastructure and superstructure investments in Kayseri free zone	Turkey	Literature Review & Descriptive Analysis	The study found that companies in Kayseri Free Zone investing in innovation and R&D engaged in capital-intensive production, benefited from zone privileges, and gained a competitive advantage. They reduced costs and increased production volume. It suggested companies shoul closely cooperate with Erciyes University's technopark.

Table 1. (continued)

Üçışık, S. , 1998	Türkiye'de Serbest Bölgeler	The aim of this study is to give information about free zones in Turkey and to analyse the situation by comparing with other free zones in the world.	Annual trade volumes by region, distribution of trad in free zones by country.	Turkey	Literature Review & Descriptive Analysis	As a result of the study, it has been revealed that the share of free zones ir Turkey on trade is good but weak when compared to the world in general. It is emphasized that Turkish free zones can reach better places with the determination and implementation of new targets.
Uslu, K., 1985	Serbest Bölgelerin Yatırımlar ve İstihdam Üzerine Etkilerinin Türkiye Açısından Değerlendirilmesi	This study analyzes Fre Zones in four main areas: determining production areas and foreign investment effects, structural analysis and functioning, global distribution and application forms, and the impact on the Turkish economy, emphasizing their potential benefits.	The study examines globa free zones (1970-1980), capital inputs, foreign investments, national income, trade growth, and trade volume of underdeveloped countries. It includes import/export ratios, trade structure and value, industrial growth, employment, wages, and economic contributions of free trade zones, with specific focus on Turkey's labor production (1979-1989).	Turkey & World	Heckscher Ohlin model and Hamada Theoretical Work	Free Zones attract foreign investment through exemptions, boosting imports exports, and employment. Success requires good infrastructure and minimal bureaucracy. Uniformity prevails, and employment in populous countries is limited.
Wan, Z., et. al. , 2014	Policy and Politics Behind Shanghai's Free Trade Zone Program	This article aims to provide an overview of the Shanghai FTZ and offer some reflections on it.	China's export and import.	Shanghai	Qualitative Analysis & Interviews	The Shanghai Free Trade Zone (FTZ) is perceived to be one of the major steps on the way to economic reform and liberalization in China as a pilot location of decentralization and a possible pattern of the subsequent reforms. It encourages the trade, financial services and logistics across the nations, brings foreign investment and facilitates the regional economic developments. Some of the challenges and opportunities are its effect to the other ports in the area, policies related with regulating port services, and improvement of value added services and logistics.
Yang, Y. C. , 200	A Comparative Analysi of Free Trade Zone Policies in Taiwan and Korea Baes on a Port Hinterland Perspective	The aim of this paper is to investigate the functions of a port hinterland, compare the port-type Free Trade Zone (FTZ) regulations and systems in Taiwan and Korea from a port hinterland perspective, and provide policy recommendations to the government.	The analysis includes FTZ exports and production value, Kaohsiung Port FTZ development area, investment, jobs, production value, Free Trade Zone Statistics (MOTC), Taiwan's investment capital, industrial investment, job employment, trade and production value, actual cargo volume, and job creation by port FTZ (201 base).	Taiwan & Korea	Comparative Analysis	Taiwan Korea Comparative Analysis The container terminals in Taiwan have land shortages and will be in nee of revisions on layout, which should b based on Korea. The Port-type FTZs are also supposed to match with the industrial models in the area and the customs rules are to be eased to be operational with freedom of the FTZ.
Third Category: HP Filter						
Harvey, A. C., & Jaeger, A., 1993	Detrending, Stylized Facts and the Business Cycle	This research examines the Hodrick-Prescott (HP) detrending method's potential to create misleading cyclical patterns in macroeconomic time series. It advocates for structural time series models that account for data randomness and seasonal fluctuations while discussing the drawbacks of ARIMA models and deterministic trends with a single breakpoin	US real GNP , Austrian real GDP ,The implicit deflator for US GNP ,The nominal value of the US monetary base .	United States & Austria	Structural time-series models and Trend Plus Cycle Model	The research shows that the HP filter may create false cyclical patterns in macroeconomic time series. It highlights ARIMA models' shortcomings and recommends structural time series models, which better address seasonal patterns and offer greater flexibility for accurate data depiction.
Hodrick, R. J., & Prescott, E. C. , 1997	Postwar U.S. Business Cycles: An Empirical Investigation	The paper analyzes post-war US business cycles using quarterly data, focusing on rapid fluctuations unrelated t demographic or technological changes. It presents a method for decomposing time serie into smooth trends and cyclical components by examining macroeconomic co-movements, aiming to provide insights for equilibrium theory.	Real GNP, consumption, services, durables, fixed investment, government expenditures, inventory, capital stock, hours worked, workweek, employees, productivity, M1 and M2 values, interes rates, GNP deflator, and CPI.	United States	Hodrick-Prescott Filter, Kalman Filtering, Autoregressive Proceses, Unit Root Tests and Regression Analysis	The study finds that cyclical components of macroeconomic time series differ significantly from trend components. Growth in output, investment, consumption, capital stock, and productivity is proportional while employment varies little. Cyclical changes in output are driven by employment hours, with a negative correlation between cyclical capital stocks and output. Cyclical consumption varies half as much as output, and investment varies three times as much. The Hodrick-Prescott filter's smoothing parameter is not sensitive except at very large values.

Table 1. (continued)

Maravall, A., & del Río, A. , 2001	Time aggregation and the Hodrick-Prescott filter	This research examines the time aggregation characteristics of the H filter in decomposing time series into trend and cyclical component across different datasets It explores if combined estimates align with aggregated series result and suggests criteria fo determining 'near-equivalent' HP filters and suitable parameter values for consistency.	The document does not specify any particular dataset used in the study.	Not specific country but Spain's data were used.	ARIMA and IMA Models	The research presents an in-depth examination of the time aggregation characteristics of the HP filter and delivers practical recommendations for choosing appropriate λ values based o various observation frequencies.
Ravn, M. O., & Uhlig, H., 2002	On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations	This research investigates adjusting the HP filter for different observation frequencies, showing that the filter parameter should be multiplied by the fourth power of the frequency ratio. It provides time and frequency domain analyses and demonstrates the adjustment's importanc using US GDP data.	The study uses U.S. real GDP data from the Bureau of Economic Analysis for the period 1947–2000.	United States	Analytical Analysis, Empirical Ilustration & HI Filter	The study shows that the HP filter parameter should be adjusted by the fourth power of the observation frequency ratio. For example, 1600 fo quarterly data equals 6.25 for annual data. US GDP analysis validates this, and recalculated business cycle metric show decreased post-war output volatility, supporting traditional views

Source : Author's own construction

CHAPTER 3

METHODOLOGY

This section outlines the methodology used to analyze whether free zones in Turkey impact structural unemployment. Our study aims to analyze the relationship between structural unemployment, one type of long-term unemployment, and free zones in Turkey. A combination of quantitative techniques, economic modelling, and data analysis is used to employed.

3.1. Research Design

Structural unemployment is a type of long-term unemployment that occurs due to a mismatch in the labor market (Investopia, 2024). Another actor in this study, free zones, contributes to the country's economy by providing various advantages and opportunities, such as tax exemptions to the firms in that region. Therefore, in this study, we conducted quantitative research in order to address the relationship between structural unemployment in Turkey and free zones in Turkey. In the study, a panel data model was used to capture both cross-sectional and time series dimensions better and to provide comprehensive insights into the dynamics of the variables in the study over time. On the other hand, since it is not easy to measure structural unemployment, we used the Hodrick-Prescott (HP) filter to measure structural unemployment and estimate the extent of structural unemployment in Turkey. The purpose of using this filter is that the HP filter can eliminate short-term fluctuations in time series studies and long-term trends (Hodrick & Prescott, 1997). In this study, we identify structural unemployment by applying HP filter to unemployment data and call the trends we obtain by separating them from cyclical unemployment as structural unemployment. Therefore, we tried to see whether free zones in Turkey have an impact on structural unemployment.

3.2. Data Collection

While conducting this study, we used data from various sources. Firstly, we use TurkStat's 2004-2023 regional and broad age group unemployment data to measure structural unemployment. In this study, we focus only on the regions identified by their respective codes, as listed below by Table

Table 2. Regions in Turkey

Code	Region Name
TR10	Istanbul
TR21	Tekirdağ-Edirne-Kırklareli
TR22	Balıkesir-Çanakkale
TR31	Izmir
TR32	Aydın-Denizli-Muğla
TR33	Manisa-Afyon-Kütahya-Uşak
TR41	Bursa-Eskişehir-Bilecik
TR42	Kocaeli-Sakarya-Düzce-Bolu-Yalova
TR51	Ankara
TR52	Konya-Karaman
TR61	Antalya-Isparta-Burdur
TR62	Adana-Mersin
TR63	Hatay-Kahramanmaraş-Osmaniye
TR71	Kırıkkale-Aksaray-Niğde-Nevşehir-Kırşehir
TR72	Kayseri-Sivas-Yozgat
TR81	Zonguldak-Karabük-Bartın
TR82	Kastamonu-Çankırı-Sinop
TR83	Samsun-Tokat-Çorum-Amasya
TR90	Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane
TRA1	Erzurum-Erzincan-Bayburt
TRA2	Ağrı-Kars-Iğdır-Ardahan
TRB1	Malatya-Elazığ-Bingöl-Tunceli
TRB2	Van-Muş-Bitlis-Hakkari
TRC1	Gaziantep-Adıyaman-Kilis
TRC2	Şanlıurfa-Diyarbakır
TRC3	Mardin-Batman-Şırnak-Siirt

Source: Turkish Statistical Institute (2024)

In order to measure the relationship between structural unemployment and free zones, structural unemployment was used as a dependent variable, trade volume, number of firms, number of operating licenses for each free zone, as independent variables by using the data obtained from the Republic of Turkey Ministry of Trade,

General Directorate of Free Zone. Moreover, regional GDP, education level, and migration rates received obtained from TurkStat were used as control variables. Since there are missing years in the data set on free zones, we prepared an annual data set covering the period between 2013 and 2023 with the data obtained from TurkStat and the General Directorate of Free Trade Zones. Firstly, unemployment rate (%) data from TurkStat is used for structural unemployment, which is used as the dependent variable, because unemployment rate is chosen as the main indicator to measure the effects of free zones on structural unemployment. In this study, although unemployment rates for the 15-64 age group for the years 2014-2023 are used, since there is no data for the 15-64 age group in TurkStat, data for the 15-55+ age group for 2013 are used. For GDP (%), which is one of the control variables in the model and is used to control the effect of economic growth in the regions on unemployment, 2009-based GDP percentage change data covering 26 Regions (Level 2) for the years 2013-2023 from TurkStat was used. The biggest reason for choosing this independent variable is that unemployment rates are expected to decrease (unemployment rates increase) in places with economic growth (economic stagnation). The level of education, which is used as a control variable in the study, is used because the mismatch in qualifications between labor supply and demand causes structural unemployment. The use of education level in the model is critical, especially since the lack of skilled labor in a region causes an upward increase in structural unemployment. For this reason, the data on completed education level ratios (doctorate, master's degree, college or faculty, high school, and equivalent vocational school) of the 15+ age group are used. These data cover 26 regions (Level 2) and the years 2013-2023. The reason for using education level as a control variable in this study is to analyze free zones' impact on structural unemployment independently. Finally, the net migration rate, which is used as a control variable, is preferred since it may potentially change structural unemployment rates by affecting labor demand and supply in regions. To calculate the net migration rate, the regional distribution of the working age population (15-64 age range) (26 Regions - Level 2), and the data on migration to and from these regions are used. Our study used this data set to examine the relationship between structural unemployment and free zones. To carry out this relationship accurately, a correlation matrix (see Appendix A) was created to evaluate the interrelationships between the selected variables prior

to starting the regression analysis. In this correlation graph, both the numerical Pearson coefficients and the strength and direction of the variables are displayed, with ellipses used to illustrate this relationship (Friendly, 2002). The dark blue shades and longer ellipses in the graph indicate a positive correlation between the variables, while the orange shades indicate a negative correlation. For example, there is a high positive correlation (r = 0.99) between the number of firms and the number of operating licenses. This indicates an almost perfect collinearity. Similarly, trade volume is strongly correlated with both the number of firms and the number of operating licenses. On the other hand, variables such as GDP and NMR, which are used as control variables in our study, are weakly correlated with other variables. This preliminary analysis of our variables using the correlation matrix is important for identifying possible multicollinearity and demonstrating the robustness of the regression model that will be presented in the remainder of our study.

3.3. Estimation of Structural Unemployment

Structural unemployment is the most long-term and permanent type of unemployment due to the mismatch between supply and demand in the labor market. As mentioned before, measuring structural unemployment is difficult, so alternative methods are used. In this study, we used the Hodrick-Prescott Filter, one of the alternative methods, because this filter is widely used in the literature to distinguish between long-term trends and short-term fluctuations in time series analyses (Hodrick & Prescott, 1997). Furthermore, the trends obtained with the HP Filter represent long-term movements in the data and show fundamental structural changes, such as economic growth.

The primary purpose of the HP filter is to separate the time series into trend and cyclical components (Ravn & Uhlig, 2002). In this study, the remaining trends are structural unemployment when the cyclical components are removed from the time series. Mathematical representation of the HP Filter;

$$y_t = \tau_t + c_t \qquad (1)$$

Where y_t is the observed unemployment rate, τ_t is the long-term trend component of y_t, i.e. structural unemployment, and c_t is the cyclical component.

In addition, HP Filter,

$$\min_{\tau_t} \sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \qquad (2)$$

can also be expressed as an optimization problem as (2). If we examine this problem in more detail;

$$\sum_{t=1}^{T} (y_t - \tau_t)^2 \qquad (3)$$

the sum of squares of the difference between the observed unemployment rate and the trend is expressed in (3). The aim here is to approximate the τ_t data as closely as possible to the y_t data. Thus, the trend captures the general course of the unemployment rate.

Smoothness is one of the most critical conditions in HP Filter.

$$\lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \qquad (4)$$

The term in (4) represents the second derivative of the trend. The purpose here is to show the slope with cyclicals. The HP Filter tries to minimize this term to smooth the trend. This is because it avoids fluctuations and ensures that the trend exhibits a long-term structure. The λ in the above term is the smoothness parameter and plays an important role. If λ is low, the trend is a polynomial, a curve, but if λ is high, the trend approaches a line. The smoothness parameter is used in economic analyses as 100 for annual data, 1.600 for quarterly data, and 14.400 for monthly data (Ravn & Uhlig, 2002). In our study, we used annual time series for regional and broad age groups (15+) between 2004 and 2023 to find structural unemployment in Turkey. Therefore, we added a smoothness parameter to the model as λ =100.

Although the HP Filter, which we have used in this study, can separate trends and cycles well, this filter has some limitations. The first of these limitations is that the parameter value (λ) must be determined correctly. Because, if this parameter is not selected correctly, we may encounter misleading results at the end of the test, and towards the end of our dataset, the HP Filter may exhibit a limiting effect, making it difficult to accurately estimate the trend component. Due to all these limitations, it is very important to interpret the HP Filter results carefully.

3.4. Model Diagnostics

In this study, since there have been some missing observations for years in the data set, we used an unbalanced panel data regression model to analyze the impact of free zones on structural unemployment in Turkey. The basic decomposition is the following;

$$SU_{it} = \propto + \beta_1 \log TV_{it} + \beta_2 \log NF_{it} + \beta_3 \log NOL_{it} + + \delta_1 \log GDP_{it} + \delta_2 \log EDU_{it} + \delta_3 NMR_{it} + \lambda_t + \varepsilon_{it} \quad (5)$$

Where; SU_{it} is the structural unemployment in the region in year t, log $\_TV_{it}$ is the trade volume of free zones in the region in year t, log $\_NF_{it}$ is the number of firms in free zones in the regions in year t, log $\_NOL_{it}$ is the number of operating licenses in the region in year t, log $\_GDP_{it}$ is the gross domestic product of regions, log $\_EDU_{it}$ is the education level of regions in time t, and NMR_{it} is the net migration rate found by '$\frac{immigration\ received - given\ immigration}{population}$' , δ is the vector of coefficients for the control variables, λ_t is the time effect, and ε_{it} is the error term.

Since the model has the λ_t, there is also a control of time fixed effects by way of year dummies. These effects allow for unobserved time-specific shocks, that is, macroeconomic fluctuations (or national policy changes) that could impact all the cross-sectional units simultaneously. Adopting controls for such temporal heterogeneity ensures that the estimated coefficients express the within-year variation across regions unbiasedly, by accounting for the omission of common time readings.

All variables specified in this model have a selection purpose. For example, trade volume is used to reflect the effect of trade openness and integration in free zones on labor demand. Drawing inspiration from the studies of Aggarwal (2007) and Basu (1996), an increase in a country's trade volume is expected to lead to increased employment through investment-driven job creation, thus predicting an adverse effect of trade volume on structural unemployment. The number of firms is included to represent entrepreneurial activities in the zones, along with the privileges applied in free zones. As suggested by Feldman and Florida (1994), as firm density increases, labor absorption and innovation spillovers may also increase, which is expected to be a mitigating factor in structural unemployment. Similarly, the number of operating licenses is important for facilitating institutionalization and determining administrative capacity. Acar and Gültekin-Karakaş (2017) emphasize in their study that streamlined regulations to be made in free zones can increase the performance of firms located in these zones and reduce unemployment. Therefore, it is thought that this may lead to a negative relationship with structural unemployment.

When examining the control variables used in our study, GDP was included to reflect the impact of free zones on the country's overall economic development. According to Kibritçioğlu (1997) and Elmeskov & MacFarlan (1993), a better labor market is associated with higher regional GDP; therefore, the expected sign in the tests to be conducted is negative. On the other hand, it is important to take into account the level of education and the quality of the existing workforce, especially in interpreting structural unemployment arising from labor market mismatches and skill mismatches; Herz and Van Rens (2011) indicate in their study that high education reduces skill mismatches and thus supports the increase in employment, reducing structural unemployment. The net migration rate (NMR) was used to represent labor mobility between regions. Although the literature, including Domenech (2024) and Estevão & Tsounta (2011), suggests that the effect of NMR may vary by region, it is emphasized that migration is more likely to reflect labor demand in regions with active free zones in terms of the economy. Therefore, NMR is expected to have a neutral or slightly negative effect in our study.

This model can help us understand the impact of free zones on the local and national economy in our study. Free zones, one of the two actors of our model, are special

areas where export-oriented production and trade are encouraged. The free zones in Turkey considered in this study were established to attract foreign investment, increase exports, increase labor and labor productivity, and promote technological innovation. Because of the low tax rates and customs facilities applied in free zones, domestic and foreign investors come to these regions and contribute to economic growth by investing in these regions. The relationship between unemployment, which is another issue we have addressed in this study, and the economic growth that emerges thanks to free zones can be analyzed, especially with Keynesian and classical theory. In Keynesian theory, there is a direct relationship between economic growth and employment. New employment opportunities can be created, and growth can be supported by investments made in free zones. On the other hand, if we interpret this relationship with classical economics, economic growth is based on the free market, and it is important for the labor market to function more effectively. Our hypotheses in the model we have designed in this study;

$H_0 =$ Free zones significantly reduce structural unemployment through the long $-$ term employment opportunities they create.

H_1
$=$ The impact of free zones on structural unemployment varies according to the employment dynamics and economic conditions of the region in which they are located.

The purpose of the model, which we will explain all the test stages below, is to examine the relationship between structural unemployment and free zones in Turkey, which is also lacking in the literature.

Thus, with this model (5), we could analyze observations with different time intervals. First of all, we applied the Hausman Test, which helps to determine whether the model is a fixed effects model or a random effects model in studies where a panel data model is preferred. The main purpose of this test is to determine the statistical significance of the difference between the results of the fixed effects

model and the random effects model. As a result of this test, if the difference is significant, the fixed effects model is preferred; if not, the random effects model is preferred (Hausman, J.A., 1978). This test, whose formula is;$H = (a - A)'[V_a - V_A]^{-1}$(a-A), has a wide range of applications in econometric analyses. If we examine the formula, a is the fixed effects estimator, A is the random effects estimator, and V_a and V_A are the variance-covariance matrices of these estimators. If we look at the hypotheses of Hausman test;

$$\mathrm{H}_0 = \text{Preffered model is random effects}$$

$$\mathrm{H}_1 = \text{Prefferd model is fixed effects}$$

Hausman test checks the assumption of existence of significant difference between the random effects (RE) and fixed effects (FE) estimators. When the test result is significant, this implies that one of the fundamental assumptions of the random effects model of there being no relationship between the regressors and the individual effects is not satisfactory. Thus we know that RE estimator is not consistent and in this instance we should use FE estimator. Thus, the Hausman test has imperative role to play in the determination of the more suitable model in panel data of testing the consistency of the RE model. Even when the Hausman test suggests using a random effects model, there are cases where choosing a fixed effects model may be more appropriate. One key reason is that the assumptions of homogeneity and constancy in the random effects model may not always hold. Significant heterogeneity in the data can make these assumptions invalid (Greene, W.H., 2012). Additionally, the fixed effects model is often better at controlling for individual effects of variables than the random effects model (Baltagi, B.H., 2008). Furthermore, the fixed effects model yields more reliable inferences when independent variables have fixed effects (Wooldridge, J.M., 2010). Therefore, even if the Hausman test indicates that a random effects model is preferable, it may still be more suitable to utilize a fixed effects model depending on the specific aims of our research. We subsequently utilized the Breusch-Godfrey (BG) test to evaluate the presence of serial correlation (autocorrelation) in our panel data model. This test specifically identifies serial correlations that may not be captured by the model's design. In spite of the common usage of the Wooldridge test in case of serial correlation in fixed effects panel

models, this research used a Breusch-Godfrey LM-type test, which indicates a high probability of serial correlation as well. The existence of a serial correlation in the error terms violates the assumption of separately and identically distributed disturbances to produce inefficient estimators and biased standard errors that can result in improper inferences of the importance of the model parameters (Asteriou & Hall, 2011). Furthermore, this test assumes that the error term behaves according to an AR(p) model[1]. If we look at the hypotheses of serial correlation;

$$\mathrm{H}_0 = \text{No evidence for serial correlation}$$

$$\mathrm{H}_1 = \text{Serial correlation is presenet in panel data model}$$

The p-value value is used for the hypotheses applied for serial correlation. The p-value here expresses the probability that the null hypothesis is true. If the p-value < 0.05, we reject the null hypothesis; that is, we say there is a serial correlation in the data. On the other hand, if the p-value ≥0.05, we accept the null hypothesis, i.e., we say that there is no serial correlation. After performing the Hausman and Breusch-Godfrey tests, we proceeded with the Breusch-Pagan test for heteroscedasticity, which is crucial for confirming the reliability and validity of our regression analysis model. Heteroscedasticity refers to the situation where the variance of the error terms in a regression model varies depending on the values of the independent variables. The purpose of the Breusch-Pagan test is to assess if the error terms exhibit constant variance, which would suggest there is no heteroscedasticity present. The main purpose of this test we have conducted is to determine whether the squares of the error terms estimated from the regression model can be described by a model using its independent variables (Breusch& Pagan, 1979). If we look at the hypotheses of this test,

$$\mathrm{H}_0 = \text{Residual variance is constant (homoscedasticity)}$$

$$\mathrm{H}_1 = \text{Residual variance is not constant (heteroscedasticity)}$$

In practice, when the p-value exceeds a predetermined significance level, for example 5%, we accept the null hypothesis (H_0) indicating that there is no evidence

[1] An AR(p) model, or AutoRegressive process of order p, is employed in time series analysis. It aims to forecast the current value using the previous values in the series. Mathematical representation;

$$X_t = c + \emptyset_1 X_{t-1} + \emptyset_2 X_{t-2} + \cdots + \emptyset_p X_{t-p} + \varepsilon_t$$

of heteroskedasticity in the model. On the other hand, if the p-value is less than or equal to 5%, we reject the null hypothesis, indicating the presence of heteroscedasticity. Since heteroscedasticity can adversely affect the reliability of model estimates, the model's precision can be improved by utilizing adjusted standard errors or alternative regression methods, such as robust standard errors (Breusch & Pagan, 1979). One of the assessments we carried out is the cross-sectional dependence (CSD) test, which evaluates the correlations among observations in multi-sectional datasets. The CSD test specifically investigates whether observations from different units exhibit dependence. In this study, we used the Panel Data Dependence Test (pcdtest), widely used in the literature, to test for cross-sectional dependence because of the potential problems that may arise due to the dependence of observations on each other. The PCD Test effectively identifies cross-sectional dependence, validates the model, and helps avoid biased results. This test's null hypothesis (H_0) states "no cross-sectional dependence." If the p-value is less than 0.05, we reject H_0 and conclude there is evidence of cross-sectional dependence in our model. Conversely, if the p-value is greater than or equal to 0.05, we accept H_0 and assert no cross-sectional dependence.

Detecting cross-sectional dependence (CSD) in a model can lead to inaccurate standard error estimates and misinterpretation of the data. In summary, the PCD Test improves the accuracy and reliability of our findings, especially for large panel data sets, by considering the relationship between the observations included in the model (Pesaran, 2004). We finally applied the Arellano-Bond test to check for serial correlation. Endogeneity and autocorrelation are long-standing empirical issues in dynamic panel data models when lagged dependent variables are present. To address these issues, particularly the serial correlation problem that arises in our model, this paper employs the Arellano-Bond estimator as part of the Generalized Method of Moments (GMM) (Arellano & Bond, 1991). The estimator is particularly suited when the cross-sectional size (N) is greater than the time size (T) and when unobserved heterogeneity and serial correlation in the idiosyncratic error variables have the potential to bias the estimates in traditional fixed-effects schemes. The model to be estimated is first-differenced to remove individual-specific effects, and the dependent and independent levels are used at adequate lags as instruments in the

analysis procedure. The validity of instruments is checked as a robustness test using the Sargan/Hansen test, and the existence of serial correlation in the differenced residuals is measured in the Arellano-Bond AR(1) and AR(2) tests. The use of this estimator will not only increase the reliability of the coefficient estimates by correcting for autocorrelation and possible problems of simultaneous bias but also comply with the dynamic nature of structural unemployment, which is persistent over time by its very nature. The purpose of applying this test is to determine whether a model containing a lagged dependent variable and autocorrelated error terms may yield biased and inconsistent forecasts. Therefore, we applied the Arellano-Bond test to examine whether the error terms are serially correlated at the AR(1) and AR(2) levels, particularly in models estimated using GMM (Blundell & Bond, 1998). If we look at the hypotheses of the Arellano-Bond test,

$$\mathrm{H}_0 = \text{Error terms are not serially correlated to a certain degree}$$

$$\mathrm{H}_1 = \text{Error terms are serially correlated to a certain degree}$$

If the p-value is below 0.05, we reject the null hypothesis (H_0), suggesting that order serially correlated. This indicates that the instrumental variables may be invalid, and the model is mis-specified. On the other hand, if the p-value exceeds 0.05, we do not reject the null hypothesis (H_0), which is a sign that the model is not wrong. In the context of the dynamic panel data models we have estimated using the Generalized Method of Moments (GMM), it is important to consider the results of the tests for AR(2) from AR(1) and AR(2), which we will obtain. The main reason for this is that, due to the transformation introduced by the first difference taken during the test, the existence of first-order serial correlation (AR(1)) in the differenced residuals is expected. Therefore, the statistical significance of AR(1) does not always mean that the model is misspecified (Arellano & Bond, 1991). However, if the instruments in the model are valid and the model is correctly specified, there should be no second-order serial correlation (AR(2)). Therefore, the AR(2) test is a more reliable diagnostic tool than AR(1) for assessing the validity of the instruments used (Arellano & Bond, 1991). After performing all these tests for our model, we applied the IPS unit root test to test the stationarity of the variables used in the model. This test was developed by Pesaran and Shin in 2003 to test whether the series in panel

data sets are stationary. This test gives more substantial and reliable results in panel data analyses, especially by allowing heterogeneity. The IPS test applies the Dickey-Fuller (ADF) test separately for each cross-sectional unit. It averages the individual results from the test to obtain an aggregate result for panel models. The null hypothesis of this test states that there is a unit root in all cross-sectional units, and therefore, the series are non-stationary. In contrast, the alternative hypothesis states that there is stationarity in at least one cross-sectional unit (Pesaran & Shin, 2003). The main motivation for choosing the IPS test to perform stationarity tests in this study is that the model we have designed is an unbalanced panel data model, and the IPS test can provide an effective solution by adapting to the unbalanced data structure.

In this research, we initially structured and refined the data we collected from TurkStat and the General Directorate of Free Zones under the Ministry of Trade. We used Microsoft Excel to prepare for our model testing. We addressed issues like missing values, outliers, and anomalies within the dataset in Excel. Then, we used the R programming language to analyze our dataset, which we cleaned in Excel, through the Unbalanced Panel Data Model, and performed various statistical tests, as mentioned before, to evaluate the accuracy and reliability of the data. Thus, we used the statistical packages that are available in R and are pretty helpful for our work to determine our hypotheses for the research questions we determined for our study and wanted to reach the answers to.

3.5. Limitations

In this study, we encountered several limitations that may affect the accuracy of the findings. This section will reveal these limitations for future studies. First of all, in this study, the unemployment data was used to measure structural unemployment in the regions covered from 2004 to 2023, but since the data for Free Zones were missing from 2008 to 2012, we had to construct our model for 2013 to 2023. On the other hand, although there usually are 19 free zones in Turkey, we used 18 free zones in this study. This is because, in our data, only the data for the Eastern Anatolia Free Zone were available for the years 2004-2005-2006-2007, and almost all data are

zero. Therefore, we removed the Eastern Anatolia Free Zone from our data set and did not include it in our study because we thought it would affect the results of our study. Another limitation was that the years in our data set were missing, so we used an unbalanced panel data model instead of a panel data model.

On the other hand, we encountered difficulties calculating education level and net migration rates, which we used as control variables in our model, due to the complexity of age distributions in the data. For example, the education data we needed to calculate the level of education in the regions had multiple age breakdowns, which was confusing and required scrutiny of the data to use the correct data. In order to calculate the net migration rate, the total amount of migration received and given by the regions was not given in total, and we had to calculate the totals ourselves. Moreover, we also needed population data to calculate net migration, but just like education data, it had many breakdowns, and it was not easy to create the right data. In sum, limitations in the sources we used for the data made it impossible to expand the size of the dataset and add more variables to the model. These limitations may limit the scope and validity of the model.

3.6. Conclusion

In the methodology section, we talked about how we prepared the data we found in line with the unbalanced panel data model we designed to analyze the effect of free zones on structural unemployment in Turkey, how we analyzed these data, and how we interpreted them. Furthermore, we discussed which tests we used to analyze the model and the limitations we encountered during the data acquisition process. The analyses in line with this methodological framework aim to comprehensively evaluate the relationships between dependent and independent variables while controlling for free zones and other economic indicators. In the Findings section, we will show and interpret the results of the tests we discussed in the methodology section.

CHAPTER 4

FINDINGS

4.1. Fixed Effects Model

In the fourth part of our study, we will present the detailed results of the unbalanced panel data model and other tests applied to examine the impact of free zones on structural unemployment in Turkey. In our study, we preferred the Fixed-Effects model over the panel data model. The rationale of why the chosen model was determined in the current analysis lies in the findings of the Hausman Test, investigating the correlation of the effect on individuals and the regressors. The result of the test was significant; henceforth, the assumption of orthogonality of random effects estimation was violated. As a result, the fixed effects estimator is both found consistent and efficient within the panel data context in question.

Table 3. Result of Hausman Test

SU~log_TV + log_NF + log_NOL + log_GDP + log_EDU + NMR
chisq= 52.026 **df**=6 **p-value**= 1.842E-09
alternative hypothesis: one model is inconsistent

As can be seen in the Table 3, the results of the Hausman specification test under which differences between random-effects (RE) and fixed-effects (FE) are checked to determine how well the regressors and the unobserved individual effects are orthogonal. This test gives the statistics χ^2 = 52.026, df = 6, and p = 1.842e-09, which is clearly much less than the usual 5 percent significance range. It, therefore, follows that the null hypotheses that the RE estimator is efficient and consistent is disposed of after a clear disagreement. Based on this result, it is desirable to use the

FE estimator due to the fact that it would produce unbiased and consistent estimates of parameters in the light of such endogeneity, whereas the RE would not have been consistent. FE specification differs out the unobserved heterogeneity that was due to geographical location, quality of infrastructure and sectoral composition. The method differs out the invariant attributes of each free zone by controlling the former between unobserved heterogeneity. By removing the within-zone variation in this way, this study is better able than it otherwise would be to detect the causal effect of free zone on the structural unemployment in Turkey.

Table 4. Results of Fixed Effects Model

	Estimate	Std. Error	t-value	Pr(>|t|)
log_TV	-0.00193172	0.00074475	-2.5938	0.0103258 *
log_NF	0.00757375	0.00465033	1.6286	0.1052502
log_NOL	-0.0097641	0.00473423	-2.0624	0.0406956 *
log_GDP	-0.00161972	0.008507	-0.1904	0.8492255
log_EDU	-0.02788289	0.00249143	-11.1915	<2.2E-16 ***
NMR	0.21490563	0.06171095	3.4825	0.0006325 ***
R-Squared	0.53104			
Adj. R-Squared	0.46722			
F-Statistic	31.8959 *** (p-value: <2.22E-16)			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

When we look at the results of the fixed effects model which are given in the Table 4 that we decided to apply in our study with the result of the Hausman test, we see that the logarithmic versions of the trade volume and the number of operating licenses in the free zones (log_TV, log_NOL, respectively), the logarithmic version of the education level in the regions where the free zones are located (log_EDU) and the net migration rates (NMR) in these regions are statistically significant. Based on these results, we concluded that the trade volume and the number of operating licenses in the free zones in Turkey are effective in reducing structural unemployment (Figures 2 and 3, respectively), and that this effect is significantly supported by the level of education (see Figure 4). In particular, we have seen that as the trade volume and the number of operating licenses increase, these regions

become more attractive to businesses that want to maximize their profits, thus resulting in the creation of additional job opportunities for the local workforce.

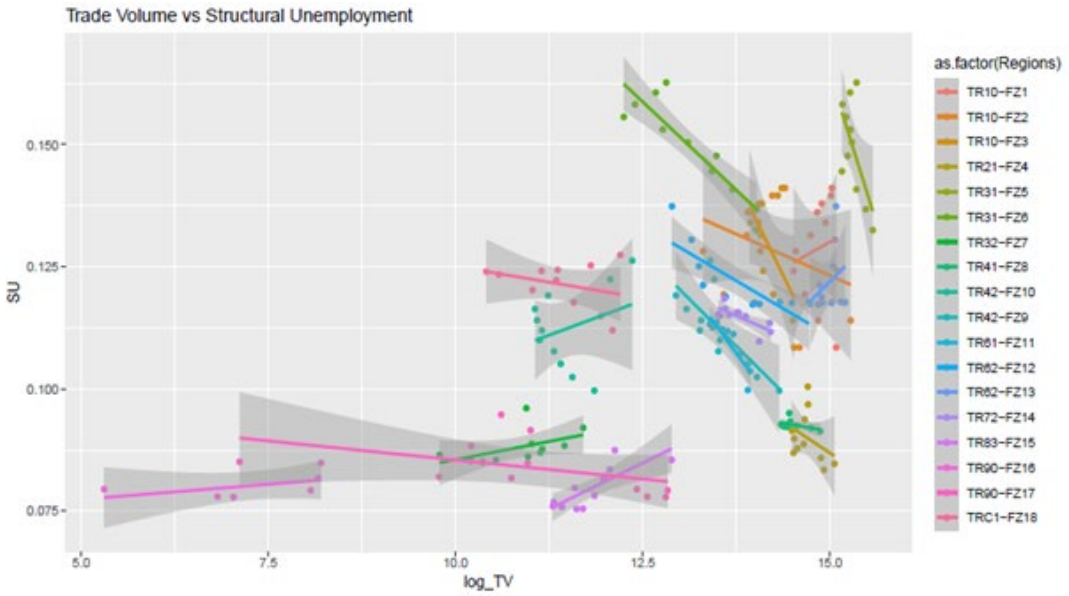

Figure 2. Relationship Between Trade Volume and Structural Unemployment
Source : Republic of Turkey Ministry of Trade, 2024

When we examine Figure 2 in detail, we observe significant cross-sectional heterogeneity in terms of levels and slopes in the relationship between structural unemployment (SU) and trade volume in free zones (log_TV). The negative slope coefficients of the regions including TR42-FZ9 (Kocaeli Free Zone), TR10-FZ2, TR10-FZ3 (Istanbul Ihtisas (AHL), and Istanbul Trakya Free Zones), TRC1-FZ18 (Gaziantep Free Zones), and TR62-FZ12 (Adana Yumurtalık Free Zone) imply that an increase in the trade activity in the free zone region has a labor-absorbing impact, possibly due to creation of demands in the tradable sectors and the exploitation of available industrial infrastructure. These regions are also characterized by a relatively high density of industry, a developed logistics infrastructure, and a closer match between the supply of labor resources and their demand by one or another sector of the economy — a situation under which the trade-employment transmitting mechanism has the potential to operate effectively.

In comparison, other areas, such as TR21-FZ4 (European Free Zone), TR32-FZ7 (Denizli Free Zone), and TR90-FZ16 (Rize Free Zone), have positive or weakly

negative slopes, and hence trade growth may align with structural unemployment. Various regional tensions can cause this: a mismatch in skills, a capital-intensive production model, or a lack of absorption capacity in the labor market. On certain occasions, there is a possibility that foreign firms may capture the economic rents of trade and reduce the local employment spill. Otherwise, in cases where the workforce is not mobile or not qualified to meet the trade-induced demand, the domestic country is unable to meet the demand, resulting in continued structural unemployment.

Overall, the results suggest that the trade-employment relationship in free zones is highly contingent. The presented variation of slope suggests that the uniformity of trade policy potentially leads to asymmetric results of the labor market and provides the necessity of complementary labor policies that will be based upon region: vocational training, relocation workforces, and human capital investments so that the process of trade liberalization would be embedded into the broad-based job creation.

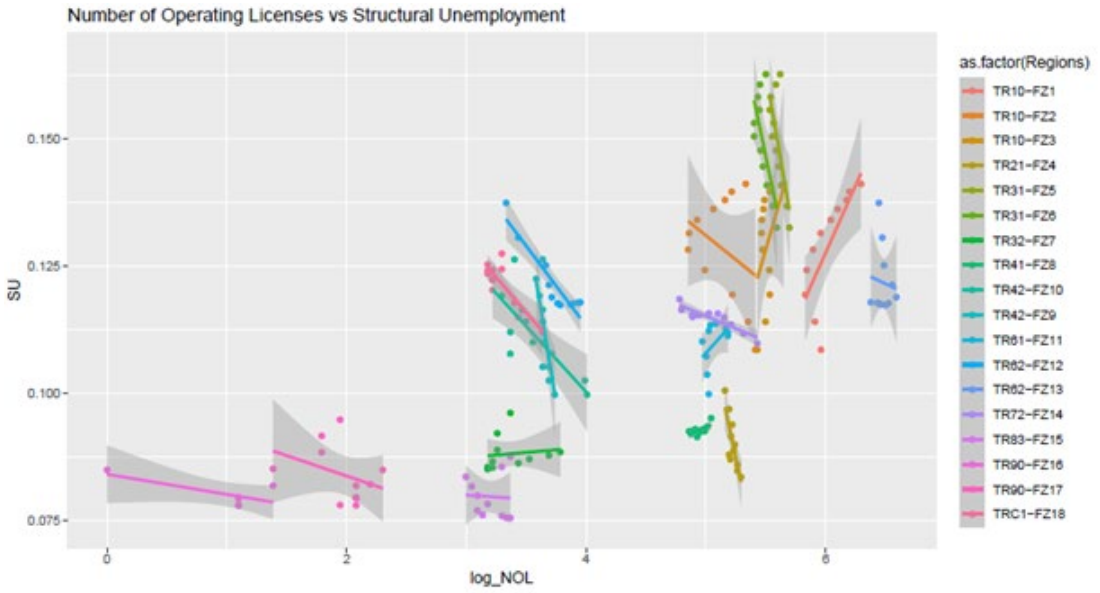

Figure 3. Relationship Between Number of Operating Licenses and Structural Unemployment

Source : Republic of Turkey Ministry of Trade, 2024

Looking at Figure 3, the connection between the number of operating licenses supplied in free zones (log_NOL) and structural unemployment (SU) across regions

also reveals significant spatial heterogeneity. The negative slope coefficients noted in most regions of the country indicate a reduction in structural unemployment when the number of firms operating in free zones increases in TR42-FZ10 (TUBITAK MAM Free Zone), TR62-FZ13 (Mersin Free Zone), TRC1-FZ18 (Gaziantep Free Zone), TR83-FZ15 (Samsun Free Zone), and TR31-FZ5 and TR31-FZ6 (Aegean and İzmir Free Zones, respectively). These trends suggest that the more licenses are awarded, especially in industrialized or labor-intensive areas, the related growth in economic activity could result in larger employment opportunities, particularly when firms are locally situated and dependent on the local labor supply. The sensitivity of employment to the immediate domestic operation in these regions is an indication of the excellent work absorption effect that may be experienced.

Nevertheless, there is a slope that is negative or has negligible positive angles in some other areas, such as TR21-FZ4 (European Free Zones) and TR32-FZ7 (Denizli Free Zones). Such desperation could be due to a structural misfit between the qualifications of the local labor force pool and the characteristics of firms settling into free zones. Take the highly automated or capital-intensive industries as an example, whereby the growth of operating licenses is not always proportional to the growth of employment. Moreover, the change in the slope levels is substantial across regions, which differences in institutional quality, institutional capacity, and the integration of local labor markets with activity in the free zone may explain. Collectively, the regional differences in slope estimates indicate that the presence of operating licenses, in general, does not necessarily mean a reduction in structural unemployment to the same extent. The employment elasticity concerning licensing is thus relative, calling forth an alternative policy differentiation that matches the licensing incentive to the local labor market and the availability of skills. It highlights the importance of complementing free zone expansion policy with a specific labor development policy in perennial macro-regions that do not respond effectively in the employment arena.

In addition, higher levels of education in regions where free zones are located contribute to the reduction of structural unemployment due to higher employment of skilled workers, which is linked to structural unemployment.

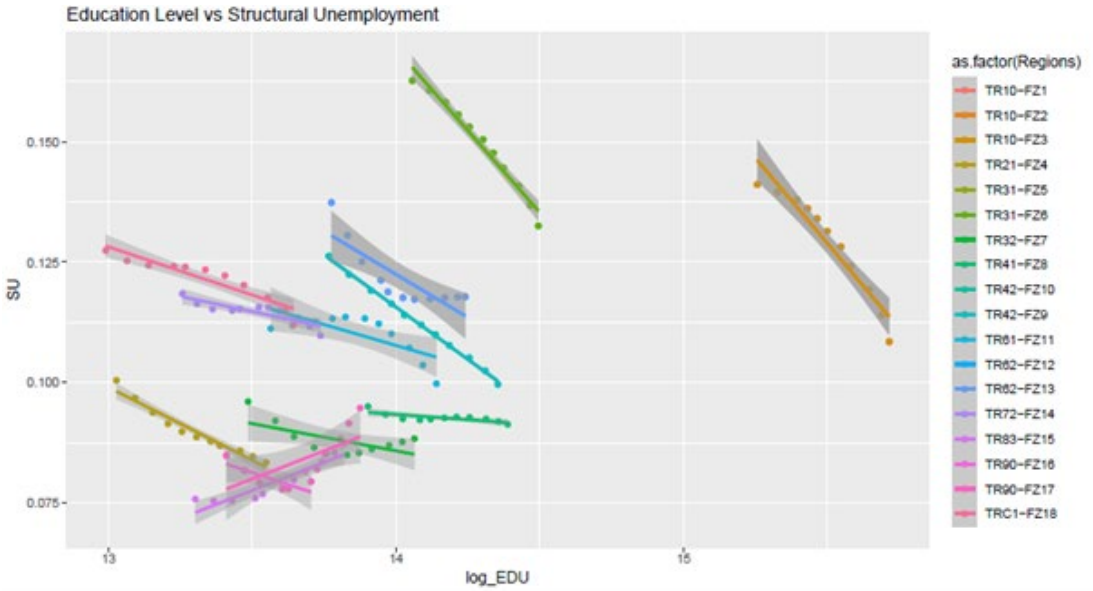

Figure 4. Relationship Between Education Level and Structural Unemployment
Source: Republic of Turkey Ministry of Trade, 2024

As the graphical description in Figure 4 shows, which illustrates the relationships between the regional level of education (log_EDU) and structural unemployment (SU), a negative dependence is practically constant across all NUTS-2 regions. These lines fitted are also negative and this means that, when the average level of education increases there are high chances of a reduction in the levels of structural unemployment. The stronger the relationship exists in areas such as TR10-FZ2 (Istanbul Ihtisas (AHL) Free Zone), TR62-FZ12 (Adana Yumurtalık Free Zone), TRC1-FZ18 (Gaziantep Free Zone), TR61-FZ11 (Antalya Free Zone), and TR42-FZ10 (TUBITAK MAM Free Zone), the higher the level of education, the more flexible the labor market appears to be and the lesser the mismatch unemployment exists. This tendency may be interpreted in the perspective of human capital theory which means that a higher level of education will make a member of the nation more flexible and mobile on the labor market, thus adhered to more closely to the changing needs of the national economy. In the case of educated workers in the sector, they are likely to acquire the cognitive and technical skills required in the evolving sectors most especially in tradable industries which are more prone to enjoy the free zone operations. Thence, it means that higher figures of log_EDU would be more resistant to structural changes and would bear the shock more effectively. It is also evident that, although slightly different results exist in different regions, the relationship is

strong and it is thus seen that education is the key in alleviating structural unemployment. This is in keeping with policy intervention guidelines that not only increase access to the education services but also improving the quality and relevance of education to the labor sectors where structural unemployment has persisted in other places in spite of the other economic dividends being experienced.

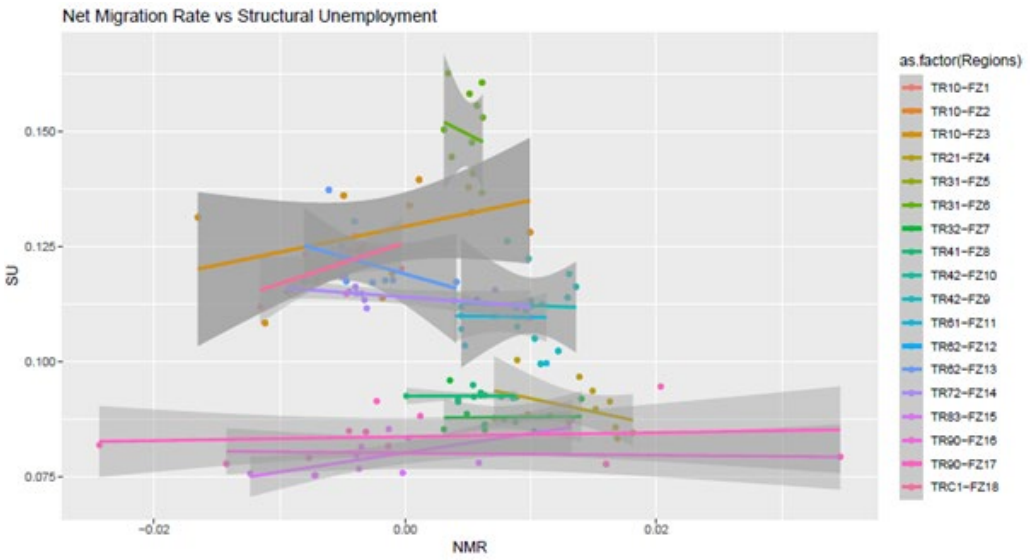

Figure 5. Relationship Between Net Migration Rate and Structural Unemployment
Source: Republic of Turkey Ministry of Trade, 2024

Conversely, as we can see in Figure 5, we observe that rising net migration rates in certain regions can lead to an increase in structural unemployment. This situation may arise for various reasons. For instance, there may not be a sufficient demand for labor in the regions where migrants settle. On the other hand, if individuals cannot find jobs that meet their criteria in their own regions, they may migrate to regions that have jobs that meet their skills, which may lead to a surplus of workers in the region they go to. Furthermore, it may cause a gap between the qualifications sought in the workforce and the available job opportunities in the region. This situation may lead to an increase in structural unemployment in the regions in question, if there are not enough job opportunities in those regions despite the migration of qualified individuals to those regions.

Compared to other variables in investigation, the correlation between net migration rate (NMR) and structural unemployment (SU) in regions has a more unclear and

regionally heterogeneous character. Although in some areas the direction of the slope is positive (TR42-FZ9 (Kocaeli Free Zone), TR32-FZ7 (Denizli Free Zone) and TR10-FZ2 (Istanbul Ihtisas (AHL) Free Zone)) indicating that in higher net in-migration area structural unemployment also tends to be high, the opposite is observed in other regions (TR21-FZ4 (European Free Zone) and TR83-FZ15 (Samsun Free Zone)) where the slope is flat. These opposing forces mean that the impact of migration on labor market frictions is extremely dependent on the ability of regional economies to absorb migrants, the skill profiles of migrants, and the integration systems operating. Migration in regions where there is high integration in the labor market with diversity of the employment opportunities, can serve to reduce structural unemployment as it can fill labor shortages. On the other hand, migration may increase mismatch and labor market pressures in areas where there is already high unemployment or movement of populations into areas not consistent with labor requirements in sectors. The upward trend experienced in the more mature urban centers like Istanbul could also be attributed to a situation known as urban saturation where population inflows are outpacing infrastructure and labor requirements causing a structural state of unemployment. Global confidence intervals and the inconsistency of the slope coefficients are indicative that even the migration variable is not a sufficient explanation of structural unemployment, and its magnitude is contingent on local aspects of the region. These results point to the importance of complementary labor market policies such as vocational training and geographical employment schemes to indeed make sure that migration has positive effects on the dynamics of the labor forces instead of accentuating structural rigidities.

The other two variables included in our model, i.e. log_NF and log_GDP were not found to be statistically significant with regard to structural unemployment i.e. log_NF and log_GDP does not have any direct influence on the phenomenon of structural unemployment. Taking account of all the performances of the model, the value of 0.531 shows that the independent variables can explain 53 percent of variance in structural unemployment. Additionally, the adjusted R^2 value of 0.467 suggests that the model's explanatory power remains significant even when accounting for individual effects. Furthermore, our F-statistic of 31.8959 ($p < 2.22e-16$) confirms that the model as a whole is statistically significant. Testing the results

of the fixed-effects model we applied in our study is important in terms of assessing the reliability of our findings. For this reason, we first performed the Breusch-Godfrey test for serial correlation in the errors, the results of which are given in Table 5. The results ($p < 2.2e-16$) we obtained indicated the presence of serial correlation in the errors in our model.

Table 5. Result of Breusch-Godfrey Test

SU~log_TV + log_NF + log_NOL + log_GDP + log_EDU + NMR

chisq= 93.694 **df=** 6 **p-value** < 2.2E-16

alternative hypothesis: serial correlation in idiosyncratic errors

The serial correlation found in the model implies that residuals at different time points within each cross-section are not independent of one another. Such serial correlation contravenes the classical premise of independently distributed errors, and therefore, estimates of standard errors computed without any adjustment are apt to be biased and provide unreliable statistical inference. As a remedy to this infringement, we adopted the Arellano estimation procedure as a means of capturing the serial correlation of idiosyncratic errors, which is achieved using the robust standard error system operating within the generalized method of moments (GMM) framework for idiosyncratic problems. Such correction is particularly important in environments with dynamic panel data, where the lagged variables can be endogenous or introduce time dependency.

Table 6. Result of Arellano- Bond Test

	Estimate	Std. Error	t value	Pr(>|t|)
log_TV	-0.00193172	0.00063994	-3.0186	0.002933 **
log_NF	0.00757375	0.00461797	1.6401	0.102852
log_NOL	-0.0097641	0.00429885	-2.2713	0.024389 *
log_GDP	-0.00161972	0.00544609	-0.2974	0.766519
log_EDU	-0.02788289	0.00118933	-23.4441	< 2.2E-16 ***
NMR	0.21490563	0.1463344	1.4686	0.143802

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

After this test, the results of which are given in Table 6, log_TV, log_NOL, and log_EDU remain significant, while NMR has started to show borderline significance, unlike in the previous test. However, log_NF and log_GDP remain insignificant despite the Arellano test. The most precise conclusion we can draw from the Arellano correction is that the effects of education level and trade volumes of free zones on structural unemployment are robust, while the impact of the net migration rate on structural unemployment is less precise. The presence of autocorrelation in a regression model implies that the residuals between time periods within a time cross-section are not independent. This serial correlation pattern contradicts a classical assumption that errors are distributed independently; thus, the probability that the standard errors will be unduly biased using unadjusted coefficients can occur, and accordingly, inferences made using the model may not withstand the results. In the current study, as a tool to deal with this problem, we use the Arellano estimation approach, where a serial correlation observed in idiosyncratic errors is considered, taking into account robust standard errors in the framework of generalized method of moments (GMM). It is particularly important in a dynamic panel-data setup that lagged variables may bring endogeneity or temporal dependency. The results after correction are given in Table 6. All three identifiers, log_TV (trade volume), log_NOL (number of operating licenses), and log_EDU (education level), are statistically significant and continue to display a consistent correlation with the phenomenon of structural unemployment. It is noteworthy that the variable of log_EDU has quite a significant value ($p < 0.001$), recording a high and strong negative correlation. By contrast, NMR (net migration rate) that had been found to be statistically significant in Table 4, now comes out to be just on the borderline of significance ($p = 0.14$), indicating that this effect is likely to be specification- or error-sensitive. In the meantime, neither log_NF (number of firms) nor log_GDP has become statistically significant after the inclusion of a variable that takes into consideration serial correlation.

Taken together these findings point to the fact that an omitted variable bias or a wrong lag specification cannot be a major cause of autocorrelation in the model. Instead, the persistence in time of structural unemployment in the economy, and dynamic path in regional labor markets are the main sources of household

autocorrelation. Therefore, after the correction of the autocorrelation with the help of the Arellano approach, the accuracy of the estimation process will be not only correct according to the statistical definition of the term but closer to the reality of the underlying dynamics of the data.

On the other hand, heteroskedasticity and cross-dependence tests are also crucial for checking the reliability of our study. Therefore, the results of the Breusch-Pagan test, which are given in Table 7 ($p = 0.1266 > 0.05$), indicate that there is no heteroskedasticity in the errors, which means that the model satisfies the assumption of homoskedasticity.

Table 7. Result of Breusch-Pagan Test

SU~log_TV + log_NF + log_NOL + log_GDP + log_EDU + NMR		
BP= 9.9551	**df**= 6	**p-value**= 0.1266

Moreover, the results of the Pesaran CD test ($p = 0.6429 > 0.05$), which we conducted to see whether our model has cross-dependency, show that it does not; that is, there is no strong dependence between individuals (see Table 8). Overall, these findings suggest that our fixed-effect model effectively meets its basic assumptions and that the forecasts are reliable.

Table 8. Result of Pesaran CD Test

SU~log_TV + log_NF + log_NOL + log_GDP + log_EDU + NMR	
z= -0.46368	**p-value**= 0.6429
alternative hypothesis: cross-sectional dependence	

In general, when examining the results of the fixed-effect and random-effect models given in Table 9, which we conducted in our study, we observe that our control variables, log_EDU and NMR, have substantial effects on structural unemployment in the fixed-effect model. In contrast, our independent variables, log_TV, and log_NOL, have a more limited but significant impact on structural unemployment. In

addition, unlike the fixed-effect model, log_NF became substantial in the random-effect model for structural unemployment, revealing the potential effect of the number of firms in free zones in Turkey on structural unemployment. However, the results of the Hausman Test and the high R-squared value we obtained confirm that the fixed-effect model is more appropriate for our study. Based on our findings, the number of operating licenses in free zones reduces structural unemployment, while the number of firms does not directly support this effect. One of the primary reasons why the number of operating licenses reduces structural unemployment is that it represents the presence of active firms that contribute to production in a given region. These firms generally meet specific criteria and intend to invest and create employment in these regions. Additionally, these companies help cut down on structural unemployment by requiring more employees, as they usually make their products for less and rely on many workers. Alternatively, having few or no correlations between the number of firms and unemployment in free zones might mean that working with only registered firms may not always work, since a high number of firms doesn't always translate into enough local jobs to reduce unemployment. In examining the two models, the level of education was considered as the most consistent variable in our research as it served to reduce the structural unemployment most consistently as well. That is why such an important role of education in combating the structural unemployment issue in Turkey is pointed out. Free zones, also, may indirectly help to fight the structural unemployment. Yet it is imperative to add that this is not the only variable that can lead to structural unemployment in Turkey because a country might have a high net migration rate as a contributing factor to structural unemployment and this is actually the case in Turkey due to free zones.

Table 9. Results of Fixed (1) and Random (2) Effect Models

	Fixed Effects Model (1)	Random Effects Model (2)
log_TV	-0.002 (0.001) **	-0.002 (0.001) ***
log_NOL	-0.01 (0.005) **	-0.006 (0.005)

Table 9. (continued)

log_NF	0.008 (0.005)	0.012 (0.005) **
log_GDP	-0.002 (0.009)	-0.003 (0.010)
log_EDU	-0.028 (0.002) ***	-0.023 (0.003) ***
NMR	0.215 (0.062) ***	0.180 (0.070) **
Constant		0.443 (0.036) ***
Observations	193	193
R2	0.531	0.365
Adjusted R2	0.467	0.344
F Statistic	31.896 ***	109.384 ***

4.2. Panel Unit Root Tests

As mentioned above, to control for the unobserved heterogeneity among the panel units, a fixed effect model is preferred, and as a result, time-invariant individual effects are captured. During our study, we found that there is a serial correlation in the residual values, which implies the existence of temporal dependence within the units.

On the other hand, homogeneity among the units in our model was detected, and our tests showed no cross-sectional dependence. Therefore, it is mainly transparent that the units are not correlated with each other in their error structures. In light of the results obtained, we applied the Im-Pesaran-Shin (IPS) panel unit root test, the results of which can be accessed in detail in the Appendix B, to strengthen further the results' validity and reliability, which we will discuss in the rest of this section. The primary motivation for choosing this test is its ability to account for heterogeneity in autoregressive coefficients across units. Moreover, applying the IPS test to verify the stationarity of the variables in our model is important because the presence of serial correlation in a fixed-effects model can increase the risk of spurious regression

results and weaken statistical inference. Here, we first examined the stationarity properties of our variables. While the dependent variable of our model, structural unemployment (SU) (wtbar=-18.463, p-value<2.2e-16), our independent variables, log_NOL (wtbar= -5.4392e+15, p-value<2.2e-16), log_GDP (wtbar=-6.8805, p-value= 2.982e-12), log_EDU (wtbar= -.17029, p-value=0.04429), and NMR (wtbar=-3.5254, p-value= 0.0002114) were found to be stationary at the I(0) level, log_TV (wtbar= -0.23753, p-value=0.4061), log_NF (wtbar= -0.73386, p-value=0.2315) were not found to be stationary at the I(0) level as a result of the results we obtained. The first differences between these two variables were taken, and diff_log_TV (wtbar = -2.766, p-value = 0.002837) was found to be stationary at the I (1) level. However, since diff_log_NF was still not stationary despite taking the first difference, the second difference was taken for log_NF. Thus, diff2_log_NF (wtbar= -4. 2085, p-value= 1.285e-05) was found to be stationary at the I (2) level. With these results, using non-stationary variables in the model in the difference form (diff_log_TV and diff2_log_NF) would be more appropriate (Figures 6 and 7, respectively).

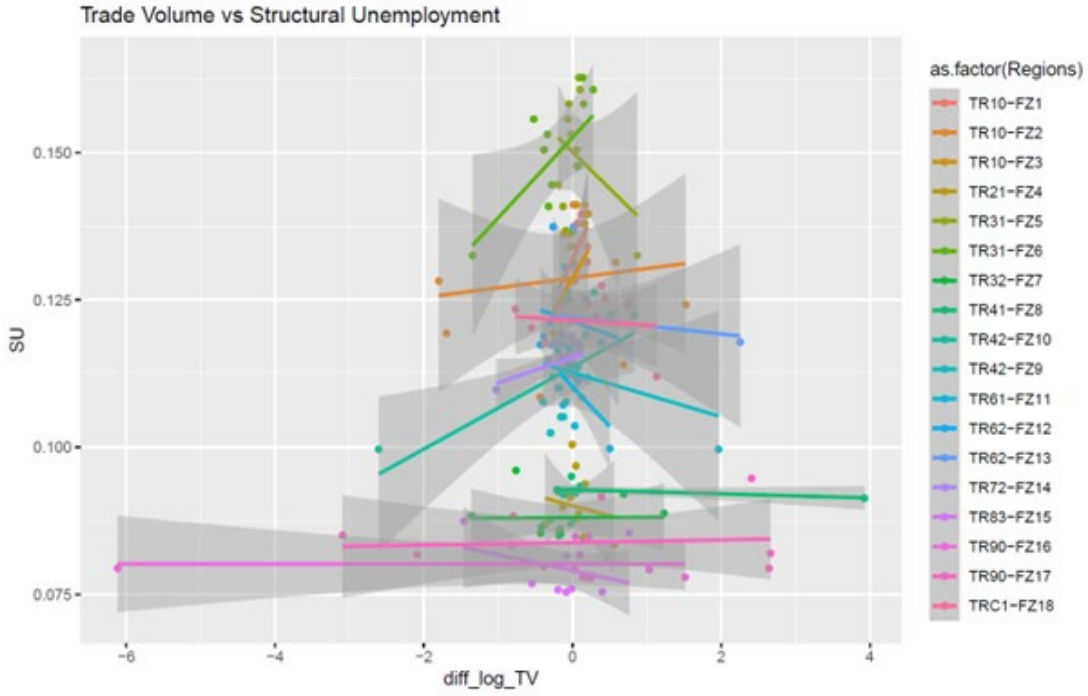

Figure 6. Relationship Between diff_log_TV and Structural Unemployment
Source: Republic of Turkey Ministry of Trade, 2024

Under consideration when the first differences of trade volume (diff_log_TV) are considered with regard to structural unemployment (SU), it shows a better and cleaner relationship in levels rather than the region-level analysis. The differenced specification explains short-run fluctuations in the trade activity and hence separates short-run shocks to trade as opposed to long-run trends. Nevertheless, determining the slope coefficients of regions can differ a lot, as stated in graph, some regions positive, some negative, some confidence bands are broad and are overlapping, which calculates statistical imprecision in the regional estimates. The slope is negative in some provinces including TR42-FZ9 (Kocaeli Free Zone), TR83-FZ15 (Samsun Free Zone), and TR31-FZ5 (Aegean Free Zone), which means that even a temporary growth of trade flow is connected with a decrease in structural unemployment levels of such regions which can have different causes including the rapid adjustment of the labor market or the ease of regional economies. Conversely, other regions such as TR10-FZ2 (Istanbul Trakya Free Zone), TR21-FZ4 (European Free Zone), and TR32-FZ7 (Denizli Free Zone) have positive slopes which indicate that, there can be positive effects of sudden upsurge in the amount of trade activity and this may temporarily induce local labor market mismatches possibly because of the slow pace in the employment response, or in ability mismatch. On the whole, the inconsistency of the slopes implies that short-run trade shocks may differ across regions in their effects on structural unemployed based on the level of labor market rigidities, industrial composition, and employment elasticity on the local labour market under the changes in the trade effects. The bottom line is that such trade shocks may even have an opposite effect on a certain region. These findings hold up the inclusion of differenced trade regressors in dynamic panel equation (i.e in GMM models) as well as remind of the importance of interpreting the results cautiously as first-differenced variables can be said to be prone to outliers and could be reflective of the short-run volatility as opposed to long-term transitions that the data is trying to reflect.

The relationship between the second difference of the number of firms in free zones (diff2_log_NF) and structural unemployment (SU) shows quite a random and statistically poor trend over the Turkish regions. The differenced specification is supposed to capture firms accelerating or decelerating in activity i.e. not only the

change in the number of firms, but the change in the speed of change, and will such effects of dynamic firm formation contribute to labor markets?

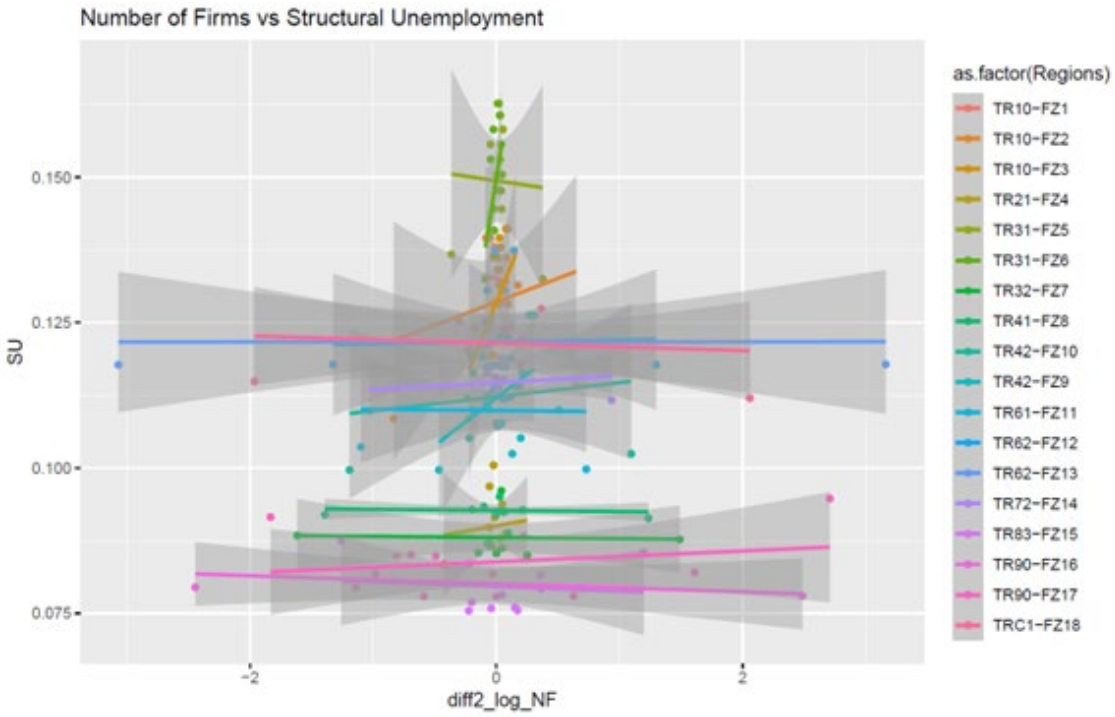

Figure 7. Relationship Between diff2_log_NF and Structural Unemployment
Source: Republic of Turkey of Trade, 2024

The obtained best fit slopes are, however, mostly flat or weakly parameterized with a wide 95 percent confidence interval in most areas indicating the low source-to-noise ratio and the frailty of the short-wavelength connection between business activity and structural unemployment. In some areas like TR31-FZ6 (Izmir Free Zone), and TR10-FZ2 (Istanbul Trakya Free Zone), the slopes are also positive that it means increases in the rate of firm growth is likely to see increases in structural unemployment, which could be as a result of market saturation, automation as well as skills mismatch. However, in other, less industrialized areas, especially in the East, trough TR83-FZ15 (Samsun Free Zone), TRC1-FZ18 (Gaziantep Free Zone) or TR62-FZ13 (Mersin Free Zone), the slope is still flat, or begins to be slightly negative, which may suggest that there is to some extent some absorptive capacity of structurally unemployed workers in cases where an intensive increase in the rates of firm entry is sustained. On the whole, the low strength of statistical precision and the

lack of clarity on the directional effect of diff2_log_NF, indicates that anticipation of short-range fluctuation of firm dynamics as inputs into the labor market related expectations regarding structural unemployment is not relevant. The findings underscore the significance of long-term establishment and consolidation of firms compared to the short-term fluctuations with the notion that policy making should not only emphasis on quantity but even on the quality, orientation to the sector and sustainability of firm expansion in free zone.

After performing our unit root tests, we re-ran our fixed effects model, adjusting it according to the unit root test results. Thus, the new version of our model is,

$$SU_{it} = \propto + \beta_1 \text{diff\_log } \_TV_{it} + \beta_2 \text{diff2\_log } \_NF_{it} + \beta_3 \text{log } \_NOL_{it} + \\ + \delta_1 \text{log } \_GDP_{it} + \delta_2 \text{log } \_EDU_{it} + \delta_3 NMR_{it} + \lambda_t + \\ \varepsilon_{it} \quad (6)$$

Table 10. Result of Panel Unit Root Test

	Estimate	Std. Error	t-value	Pr(>|t|)
diff_log_TV	0.00016182	0.00050008	0.3236	0.746657
diff2_log_NF	0.00066765	0.00063813	1.0463	0.296956
log_GDP	-0.00093634	0.00829124	-0.1129	0.910221
log_NOL	-0.00566741	0.00230244	-2.4615	0.014853 *
NMR	0.20046843	0.06240315	3.2125	0.001579 **
log_EDU	-0.02815809	0.00236054	-11.9287	< 2.2e-16 ***
R-Squared	0.51018			
Adj. R-Squared	0.44272			
F-Statistic	28.9901 *** (p-value: <2.22E-16)			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

If we examine the results of our adjusted model, which are given in Table 10, we see that the log_NOL, log_EDU, and NMR variables are statistically significant. As with the previous fixed-effect model, we concluded that log_NOL reduces structural unemployment in free zones; log_EDU again has a crucial role in reducing structural unemployment, and NMR leads to increased structural unemployment. On the other hand, diff_log_TV, diff2_log_NF, and log_GDP are not found to be significant in terms of their effects on structural unemployment. It is noteworthy that log_TV is

statistically significant before the panel unit root test is performed, but is insignificant in the diff_log_TV version afterward, and there may be many reasons for this. First, the initial significance of log_TV may be due to capturing both long- and short-term dynamics. However, the insignificance of diff_log_TV may result in the elimination of level effects and the focus on short-term fluctuations only, eliminating the tendency to contribute to the significance of the fixed effects model. Second, suppose log_TV is not stationary in level form. In that case, differencing may have made it stationary, but this may come at the cost of reducing its explanatory power, especially if the relationship with the dependent variable is predominantly a long-term phenomenon rather than a short-term adjustment process. The third reason is that, as stated in previous tests, the existence of serial correlation in the fixed-effect model may have inflated the effect of log_TV on the dependent variable (SU). While the serial correlation is eliminated by taking the difference, it may also have weakened the signal in an unbalanced panel with varying time intervals between units. Finally, the unbalanced panel model structure we used in our study may create heterogeneity in the series taken into account and reduce the statistical power of diff_log_TV in the model. When we look at the R-squared value and adjusted R-squared results of the new version of our model formed after the panel unit root is performed, they are 0.51018 and 0.44272, respectively. These results show us that our independent variables explain 51% of the variance in structural unemployment and that our model can provide a better fit if we consider individual effects. The F-statistic of our model (28.9901, p-value< 2.22e-16) showed that the model significance was good, meaning that at least one predictor was associated with structural unemployment. As we did in the previous fixed-effect model, we performed various diagnostic analyses to test the accuracy of the panel unit root test. The first is the serial correlation test, which was present when we first did it. To test for serial correlation, we conducted a Breusch-Godfrey test and found a serial correlation ($p < 2.2e-16$) in our model. Then, with the Breusch- Pagan test ($p = 0.04613$), the p-value is just below 0.05, suggesting that there may be heteroskedasticity in our model and the variance is not constant. Following the previous tests, the last diagnostic test we performed was the Pesaran CD test. The results of this test revealed that there was no cross-dependency or strong correlation between individuals in our model ($p = 0.21 > 0.05$). As a result, we found that first-

generation panel models were appropriate for our analysis and used the Arellano method, the results of which can be seen in Table 11, to calculate robust standard errors to account for serial correlation and heteroskedasticity.

Table 11. Result of Arellano Test for Panel Unit Root Test

	Estimate	Std. Error	t-value	Pr(>|t|)
diff_log_TV	0.00016182	0.00051152	0.3164	0.7521
diff2_log_NF	0.00066765	0.00057906	1.153	0.2506
log_NOL	-0.00566741	0.00082681	-6.8545	1.32E-10 ***
log_GDP	-0.00093634	0.00565106	-0.1657	0.8686
log_EDU	-0.02815809	0.00154936	-18.174	< 2.2E-16 ***
NMR	0.20046843	0.13643827	1.4693	0.1436

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Our corrections make log_NOL and log_EDU still significant, but NMR is gone from the significance range, though it is significant in the results provided in Appendix C. In addition, this analysis found that diff_log_TV, diff2_log_NF, and log_GDP remain not significant. So, sturdy standard errors allow log_NOL and log_EDU to reliably influence structural unemployment, and the result for NMR is expressed less precisely. In our ongoing tests , we attempted to re-estimate the fixed-effects model by incorporating the lagged dependent variable, lag_SU, to achieve more realistic and accurate results. By considering the time dimension of our model and the dynamics of our dependent variable, we aimed to enhance the flexibility and robustness of the fixed-effects model in our panel data set. The result of the analysis that is given in Table 12, we made with the formula of our new modified model,

SU ~ lag_SU + diff_log_TV + diff2_log_NF + log_NOL + log_GDP + log_EDU + NMR (7)

Table 12. Result of diff_model_fe_lag

	Estimate	Std. Error	t-value	Pr(>|t|)
lag_SU	1.07E+00	2.79E-02	38.1938	<2.2E-16 ***
diff_log_TV	-9.29E-05	1.50E-04	-0.6175	0.537871
diff2_log_NF	1.53E-04	1.92E-04	0.7948	0.428029
log_NOL	-1.44E-04	8.67E-04	-0.1658	0.868503

Table 12. (continued)

log_GDP	-4.14E-03	2.50E-03	-1.6574	0.09955 .
log_EDU	3.55E-03	1.16E-03	3.0758	0.002501 **
NMR	2.37E-02	1.94E-02	1.2205	0.224209
R-Squared	0.9494			
Adj. R-Squared	0.94119			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Lag_SU ($p < 2.2e-16$) and log_EDU ($p = 0.0025$) are significant, while log_GDP ($p = 0.0996$) is marginally significant. In particular, although the marginal and negatively significant relationship in log_GDP implies that GDP levels can reduce the structural unemployment rate, the fact that it is not at a strong significance level indicates that this result should be interpreted with caution and that we should be aware that the relationship between structural unemployment and log_GDP cannot be preserved in alternative model estimates. More specifically, the fact that the coefficient of lag_SU is close to one indicates that the structural unemployment in Turkey is persistent, and the unemployment in the previous period is largely effective in the current period. Unlike the previous model, the positive coefficient of log_EDU shows that the level of education can increase structural unemployment, which indicates that the dynamic model captures a time-related relationship missed in the static model. For example, the fact that the level of education increases structural unemployment may be due to mismatches in the labor market and the inability of the economic structure to absorb educated labor. Moreover, it may be because the dynamic model considers the interaction with past unemployment levels better than the previous model.

Suppose we interpret the general significance of the model. In that case, the model's R-squared and adjusted R-squared values are 0.9494 and 0.9412, respectively, and we see that the model's explanatory power increases considerably with the effect of the lagged dependent variable (lag_SU). On the other hand, the F-statistic of 396.701 and p-value < 2.2e-16 support the overall significance of the model, and with the analysis we have done with robust standard errors, lag_SU ($p < 2.2e-16$) and log_EDU ($p<0.01$) have maintained their significance based on their p-values.

After conducting all these tests, we finally applied the generalized method of moments (GMM) to ensure consistent estimation of the lagged dependent variable in dynamic panel data analysis and to model the time dimension in a balanced manner, incorporating individual fixed effects (see Table 13). The primary reason for switching from the fixed effects model to the GMM model is to obtain more consistent and reliable estimates, which can address problems such as endogeneity, autocorrelation, and dynamic structure that may be encountered in panel data. GMM solves these problems by using instrumental variables and is therefore preferred (Arellano & Bond, 1991). Since the test we conducted is a dynamic panel estimation technique that includes the lagged dependent variable, we have captured the persistence of structural unemployment over time. In addition, this method enables us to obtain more reliable and theoretically consistent results when analyzing complex phenomena, such as structural unemployment, particularly when unobserved heterogeneity and endogeneity are potential concerns.

Table 13. Result of Generalized Method of Moments

	Estimate	Std. Error	z-value	Pr(>|z|)
lag(SU, 1)	1.09359908	0.04410336	24.7963	<2.2E-16 ***
diff_log_TV	-0.00025398	0.0001511	-1.6809	0.09279 .
diff2_log_NF	0.00024361	0.00012558	1.9399	0.0524 .
log_NOL	-0.00079628	0.00176994	-0.4499	0.65279
log_GDP	-0.00415805	0.00098691	-4.2132	2.52E-05 ***
log_EDU	0.00436816	0.00217247	2.0107	0.04436 *
NMR	0.01714319	0.01112029	1.5416	0.12317
Autocorrelation test (1): normal	2.365568 (p-value: 0.018002)			
Autocorrelation test (2): normal	2.429311 (p-value: 0.015128)			
Wald Test for Coefficients: chisq(7)	2321.582 (p-value: <2.22E-16)			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

This GMM estimation method in the Table 13 uses second and third lags (lag 2:3). In this first estimation, lag(SU, 1) ($p < 2.2e-16$), log_GDP ($p = 2.518e-05$) and log_EDU ($p = 0.0444$) are significant, but diff_log_TV ($p = 0.0928$) and diff2_log_NF ($p = 0.0524$) are marginally significant. On the other hand,

autocorrelation tests revealed serial correlation of the first and second orders, with p-values of 0.018 and 0.0151, respectively, casting doubt on the validity of the instruments used. The high estimated AR(2) reduces the validity of the moment conditions, indicating the fact that the instruments included in the model (especially those employing shorter lags) might well be insignificant or endogenous. Arellano and Bond (1991) state that the second-order serial correlation among the differenced residuals implies the failure to meet the assumption of no correlation between the instruments and the error term. Thus, it is dangerous to have the AR(2) value because this means that the model is misspecified. To improve this situation and to increase the reliability of the estimates, the set of instruments was limited by the second lag only. Roodman (2009) also favors this decision when he encourages people not to make instruments too deep as a way of minimizing instrument proliferation and the possibility of overfitting. Following the re-estimation of the model by dropping lag 2 only, the AR(2) test statistic was found to be insignificant and it was clear that the second order serial correlation issue was addressed. Accordingly, the latter specification that incorporated the second lag only corrected the autocorrelation effect and provided more consistent and reliable coefficient estimates, especially of an important variable like the education level and GDP (see Table 14).

Table 14. Result of Generalized Method of Moments-2

	Estimate	Std. Error	z-value	Pr(>|z|)
lag(SU, 1)	1.158106	0.04593705	25.2107	<2.2E-16 ***
diff_log_TV	-0.00030469	0.00027767	-1.0973	0.272512
diff2_log_NF	0.00036632	0.00023156	1.582	0.113653
log_NOL	-0.00219829	0.00143769	-1.529	0.126256
log_GDP	-0.00379261	0.00149229	-2.5415	0.011039 *
log_EDU	0.00690409	0.00251284	2.7475	0.006005 **
NMR	-0.00386593	0.02218986	-0.1742	0.861692
Sargan Test	chisq(56) = 18 (p-value = 1)			
Autocorrelation Test (1): normal	2.293154 (p-value = 0.021839)			
Autocorrelation Test (2): normal	1.728756 (p-value = 0.083853)			
Wald Test for Coefficients: chisq(7)	967.5562 (p-value = <2.22E-16)			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

In Table 14, we restrict the model with lag 2 and re-estimate the model, lag (SU,1) ($p < 2.2e-16$), log_GDP ($p = 0.0110$), and log_EDU ($p = 0.0060$) are significant. When we look at the first-order autocorrelation results, it is interpreted as an expected situation with $p = 0.0218$, but the second-order autocorrelation test cannot be rejected at a 5% significance level with $p = 0.0839$. This is an important improvement compared to other models because it is seen that when only lag 2 is used, the AR(2) problem is largely eliminated, and the GMM assumptions become more defensible.

Finally, the Sargan test ($\chi^2 = 18$, $p = 1$) supported the validity of our instruments, and the Wald test ($\chi^2 = 967.5562$, $p < 2.22e-16$) confirmed the joint significance of the coefficients of our variables.

Table 15. Model Coefficient Comparison

Variable	Pooled_OLS	GMM	Fixed_Effects
log_TV	-0.00251	-0.000569	-0.00193
log_NF	-0.0231	-0.0018	0.00757
log_NOL	0.0336	0.00127	-0.00976
log_GDP	0.0273	-0.0027	-0.00162
log_EDU	0.00739	0.000876	-0.0279
NMR	-0.243	0.00379	0.215

To further support the fact that the GMM estimator is suitable we compared the coefficients of the GMM estimation with both the Pooled OLS and Fixed Effect estimations. By comparing GMM with the values generated using the static models, it becomes obvious that GMM estimates of important explanatory factors, including log_NF, log_NOL, and NMR, are mostly placed between those generated using the static model. To give an example, the coefficient of log_NF is estimated at -0.0231 in the Pooled OLS model 0.00757 in the Fixed Effects model and -0.0018 in the GMM model. Such a location conforms in this paper to theoretical impressions found in literature where GMM is seen like to be a halfway house between possible upward bias of Pooled OLS and downward bias of Fixed Effects in dynamics panel specifications (Bond, 2002). Thus, not only diagnostic tests but also empirical findings indicate that the Arellano-Bond estimator is the most convenient model to represent the dynamic character of structural unemployment discussed in the given paper.

4.3. Impact of Free Zones on Structural Unemployment

In our study, we applied the tests we discussed above to see Turkey's free zones' effect on structural unemployment. So, are the results we obtained the same in all free zones in Turkey, or do they vary from region to region? In this section, we will explain the structural unemployment situation in the regions using the results of our tests.

We estimated the extent to which the effects of free zones on structural unemployment are significant in the regions where they are located using a fixed effects panel regression model. The aim here is to control for unobservable and time-invariant regional characteristics that are not included in the analysis. We included regional fixed effects to base more robust estimates on the relationship between free zones and structural unemployment. Our previous econometric results confirmed the existence of persistent regional differences, as illustrated in the graphs in Figure 8. Therefore, the fact that the effects of free zones on structural unemployment in Turkey are not homogeneous is supported by both visual and econometric results.

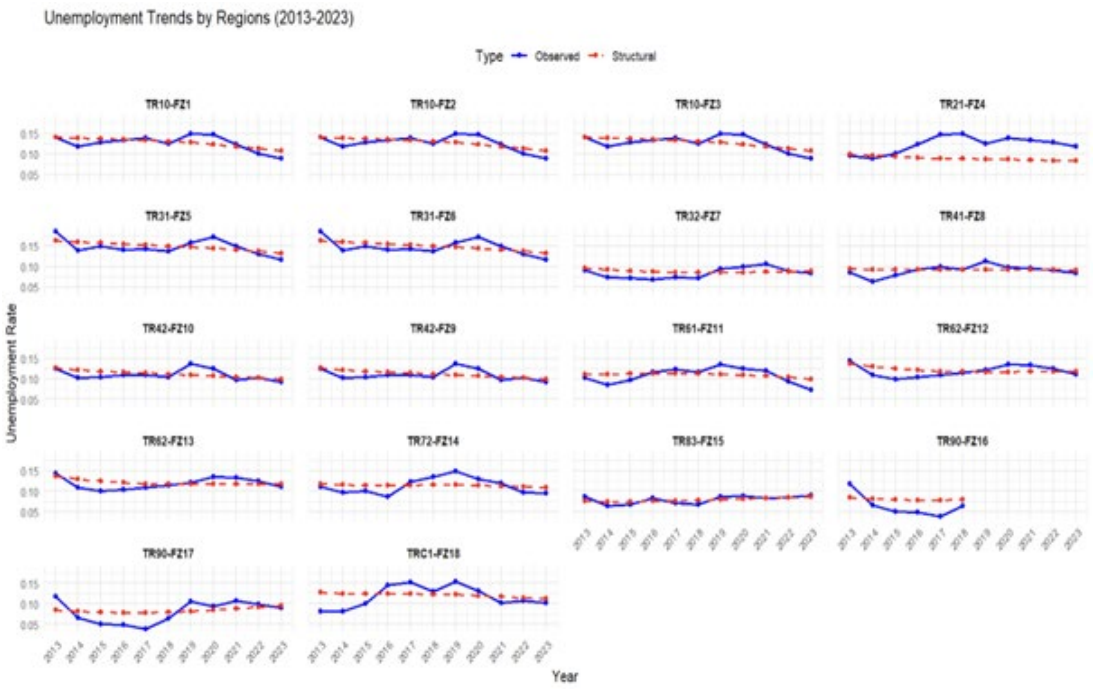

Figure 8. Unemployment Trends by Regions (2013-2023)
Source : Turkish Statistical Institute, 2024

The graphs in Figure 8 show the unemployment trends in the regions where the free zones are located in Turkey from 2013 to 2023. The structural unemployment rates in each region are also shown separately from the observed. In this way, we can easily see the structural unemployment situation in Turkey. Is the unemployment problem in Turkey structural or a mystery? Frankly, as the graphs show, the unemployment observed in most regions and structural unemployment are very close. This proves that structural factors, in other words, seriously cause unemployment; there is a serious reality beyond mystery. When we look at regions such as TR10, TR31, and TR90 in detail, there is a minimal deviation between the observed and structural measurements. This is because cyclical fluctuations have a limited effect on unemployment in these regions. On the other hand, when we look at regions such as TR21, TR41, TR62, and TR90, there are significant deviations between the observed and structural measurements. The main reasons for this are the economic shocks and cyclical factors that occur during the periods when the deviations occur. Suppose we interpret the unemployment rates in these regions in general, even if there is a slight decrease in unemployment between 2013 and 2023. In that case, there is a stable and low unemployment situation in regions such as TR83, although more significant decreases are observed compared to others, especially in regions such as TR90 and TRC1. Conversely, there has been more volatility in unemployment in regions such as TR42, TR10, and TR62. If we interpret structural unemployment in Turkey with free zones, the observed unemployment and structural unemployment rates in TR10 are essentially parallel. The main reason for this is that the economic activities in this region and the advantages offered by the free zones in this region contribute to reducing unemployment. Istanbul (TR10) is important in Turkey's economic situation and contributes to reducing unemployment by playing a key role in creating employment. In TR31, TR62, and TRC1, just like in TR10, the observed and structural unemployment have generally moved at the same level; in other words, we can see that unemployment in this region has improved and that the economic activities carried out by the free zones have played a role in the decrease in unemployment rates. In TR21, unlike TR10, the structural unemployment rate is lower than the observed unemployment rate. This shows us that the region is insufficient to reduce the unemployment rate and that economic policies should be reviewed specifically for this region. Similarly, structural unemployment in TR31,

TR42, TR61, TR72, and TR83 has remained slightly below the observed unemployment rates.

The conclusion is that free zones in these regions have a limited effect in reducing unemployment. However, we see that unemployment is affected by cyclical fluctuations rather than structural fluctuations. As far as we can observe from the results, although the structural unemployment status of free zones within the same region is the same, the structural unemployment status of the two free zones in TR90 is different due to missing data in FZ16. While the unemployment and structural unemployment observed in TR90-FZ16 move in parallel, the unemployment observed in the TR90-FZ17 graph, which also covers the years after 2018, is higher than structural unemployment. The difference here shows that the structural unemployment problem continues despite the region's economic activity increase. These problems constitute an obstacle to a full reduction in unemployment rates. As a result, structural unemployment in the regions where free zones are located in Turkey has generally decreased between 2013 and 2023, which is around 10% in most regions. On the contrary, increases and fluctuations have been observed in some regions, such as TR41-FZ8 and TR72-FZ14. The fact that the observed unemployment is higher than the structural unemployment emphasizes that structural problems in the labor market continue and that policymakers need to produce more serious regulations and solutions to economic problems. In addition, our assumption that free zones in Turkey could play a positive role in structural unemployment before starting the study was confirmed. However, it was also shown that this effect was not homogeneous due to differences between regions.

As a result, structural unemployment in the regions where free zones are located in Turkey has generally been on a downward trend between 2013 and 2023, and this decrease is around 10% in most regions. On the contrary, increases and fluctuations have been observed in some regions, such as TR41-FZ8 and TR72-FZ14. The fact that the observed unemployment is higher than structural unemployment emphasizes that structural problems in the labor market exist and continue and that policymakers need to produce more serious regulations and solutions to economic issues. In addition, our assumption that free zones in Turkey could have a positive role in

structural unemployment before starting the study has been confirmed. However, it has also shown that this effect is not homogeneous due to the differences between the regions.

4.4. Findings in Context: Linking to Existing Literature

This study aims to examine the impact of free zones on structural unemployment in Turkey using a fixed effects model with unbalanced panel data. The empirical findings obtained throughout our study indicate that the increase in trade volume and the number of operating licenses in free zones significantly reduces structural unemployment in these zones. However, the increase in overall economic growth and the number of firms does not have a significant effect on reducing structural unemployment. These results are consistent with the arguments emphasized by Porter (1998) and Feldman and Florida (1994) about the critical roles of clustering and knowledge spillovers in driving regional competition and employment. Furthermore, our results regarding the reduction of structural unemployment through active business activities in free zones support the claims of Aggarwal (2007) and Rodriguez-Clare (1996) that free zones create strong networks that encourage firm-level innovation, thereby supporting job creation. Moreover, the negative relationship between education level and structural unemployment in regions where free zones are located is statistically significant. In particular, Herz and Van Rens (2011) and Diamond (2013) have identified skill mismatches in the labor market as one of the most significant factors contributing to structural unemployment, emphasizing that eliminating these mismatches is crucial in preventing structural unemployment. Therefore, the results we obtained regarding the education level in our study are consistent with the results for these individuals.

In addition, our findings regarding the education level, which we used as a control variable in our study, are consistent with Groepe's (2015) perspective that investing in education and training is an important factor in preventing long-term unemployment. On the other hand, the positive relationship we observed between the net migration rate, another control variable in our study, and structural unemployment is consistent with the conclusion that the mismatch between labor

supply and demand in the regions increases structural unemployment together with sudden demographic changes, as stated in the study of Tsounta (2011). In addition, the results we obtained from our analyses confirm that free zones in Turkey do not have equal effects on structural unemployment, as emphasized in the study of Danacı and Koçtürk (2017), and local contextual factors such as infrastructure, sectoral structure, and administrative capacity are important in the success of free zones. Finally, in our study, we used the HP Filter to separate the structural components of unemployment from the cyclical components, in line with the studies of Blanchard and Wolfers (2000) and Orlandi (2012) to determine structural unemployment. In particular, despite the criticisms of the HP Filter in the studies by Maravall and del Río (2001), as confirmed by our results, the HP Filter remains a valuable tool for capturing persistent trends in the labor market.

In summary, our thesis not only confirms the positive but heterogeneous effects of free zones on structural unemployment in Turkey, as suggested in the studies of Kibritçioğlu (1997) and Aggarwal (2007) but also provides a detailed view of the effects of region-specific policies and education-oriented labor market strategies on structural unemployment.

CHAPTER 5

CONCLUSION

In this thesis, the period from 2013 to 2023 is examined using an unbalanced panel data model to explore the research question comprehensively. This study aims to investigate the effects of free zones in Turkey on structural unemployment using the fixed effects model, unit root tests, and the generalized method of moments (GMM). As a result of these tests, we have demonstrated a relationship between free zones and structural unemployment, yielding valuable insights for both academic and policy purposes.

As a result of the econometric analyses we conducted in general, we concluded that the trade volumes of free zones and the number of operating licenses in these zones reduce structural unemployment and create employment opportunities by encouraging labor-intensive activities. On the other hand, we saw that the number of firms in these zones does not play a significant role in reducing structural unemployment. As can be understood from this result, it has been observed that firms alone may not capable of generating employment unless they are attended by increased production capacity and investment incentives. The education levels in the regions where free zones are located significantly reduce structural unemployment in line with the results we have obtained, and this situation underlines how important it is to consider human capital in the examination of the mismatches experienced in the labor market, which is an important criterion for structural unemployment. Compared to the situation at the level of education, the net migration rate in the regions where free zones are located increases structural unemployment rather than reduces it, and there are problems in integrating the local workforce into the labor market. At the end of our study, the GMM analysis underlines that structural unemployment in Turkey continues, that the lagged dependent variable lag_SU has

affected the current unemployment level in the past, and that this issue is a chronic problem in Turkey. At the same time, the regional analysis we conducted shows that there is heterogeneity in the performance of free zones and that regions that are stronger than others in terms of economic activities (for example, Istanbul (TR10) and Adana-Mersin (TR62)) are better at reducing the unemployment problem. However, regions that show insufficient economic activity and cannot support the labor market (for example, Tekirdağ-Edirne-Kırklareli (TR21)) have a limited effect in reducing unemployment. This finding shows that in order to enhance the efficiency of free zones in Turkey in the context of economic growth and unemployment, strategic plans should be established in accordance with the requirements of the regions taking into consideration the diversity of regions.

When we compile all the results we obtained at the end of the study, it is revealed that free zones in Turkey support policy interventions by targeting the regions to maximize their impact on employment creation. In line with the results, policymakers should prioritize efforts to increase trade volumes and facilitate the acquisition of operating licenses for companies, especially to increase labor demand in the regions. Since structural unemployment occurs due to the mismatch between labor supply and demand, educational policies focused on vocational training and skill development through on-site learning should be organized to reduce or eliminate the mismatch in regions hosting free zones. The adverse effect of net migration in the model is critical for this situation. Because the course of migration flows indicates a labor shortage caused by skill mismatches, it is essential to evaluate the regional labor market and make policies accordingly so as not to worsen this situation. As the latest GMM analysis emphasizes, structural unemployment is a serious ongoing problem in Turkey, and long-term strategies such as policies actively implemented on labor need to be redesigned and facilitated. When we evaluate the findings, some regulations that can be suggested to policymakers emerge. For example, regional inequality can be minimized by organizing special incentives for the difficulties experienced in the labor market in regions that perform less well than others. Moreover, economic development plans with a broader scope can be adapted by integrating technology and innovation into free zones. Thus, the impact of these

regions on long-term reduction of structural unemployment and sustainable economic growth can be increased.

In the globalized world, many things are not the same as before. Digitalization may become widespread more, automation and sustainable industries will be more popular than before, free zones will develop with such elements in the future, and the structure of labor demand will change. Although our study provides findings that free zones have a positive effect on structural unemployment, the effectiveness of these zones may also depend on their compatibility with specialized technologies and sectors such as green energy, which have recently become popular in the literature. If free zones are not aligned with global trends, especially if they cannot adapt to emerging new sectors and skill mismatches increase, the effect of free zones on employment may weaken. In addition, geopolitical developments are important for foreign investments to continue in these regions. Because the attractiveness of these regions may be affected, difficulties may arise in employment creation.

Our findings not only strengthen the existing literature on the positive effects of free zones on structural unemployment but also suggest that attention should be paid to region-specific dynamics in the design of policies that shape the effectiveness of free zones. Consistent with the arguments presented in the studies by Porter (1998) and Feldman and Florida (1994), the results confirm that trade volumes and the number of operating licenses in free zones positively affect labor market performance in free zones. However, in the absence of investment and innovation, the number of firms alone may not produce similar benefits. Furthermore, the negative impact of skill mismatches on structural unemployment, as emphasized by Herz and Van Rens (2011), and the integration difficulties caused by migration flows (Tsounta, 2011) highlight the importance of policymakers adopting policies that focus on education and are locally responsive. Despite some limitations of the HP Filter we applied, its application in this study, as used by Blanchard and Wolfers (2000), has proven to be quite critical in distinguishing persistent and structural unemployment trends.

In summary, this thesis study provides a solid foundation for designing more effective strategies on the progress of the economy in Turkey and on structural

unemployment with free zones in Turkey. In future studies on this subject, the long-term effects of free zones in Turkey can be examined using the findings obtained in this study and a broader time period or additional variables to be added to the model.

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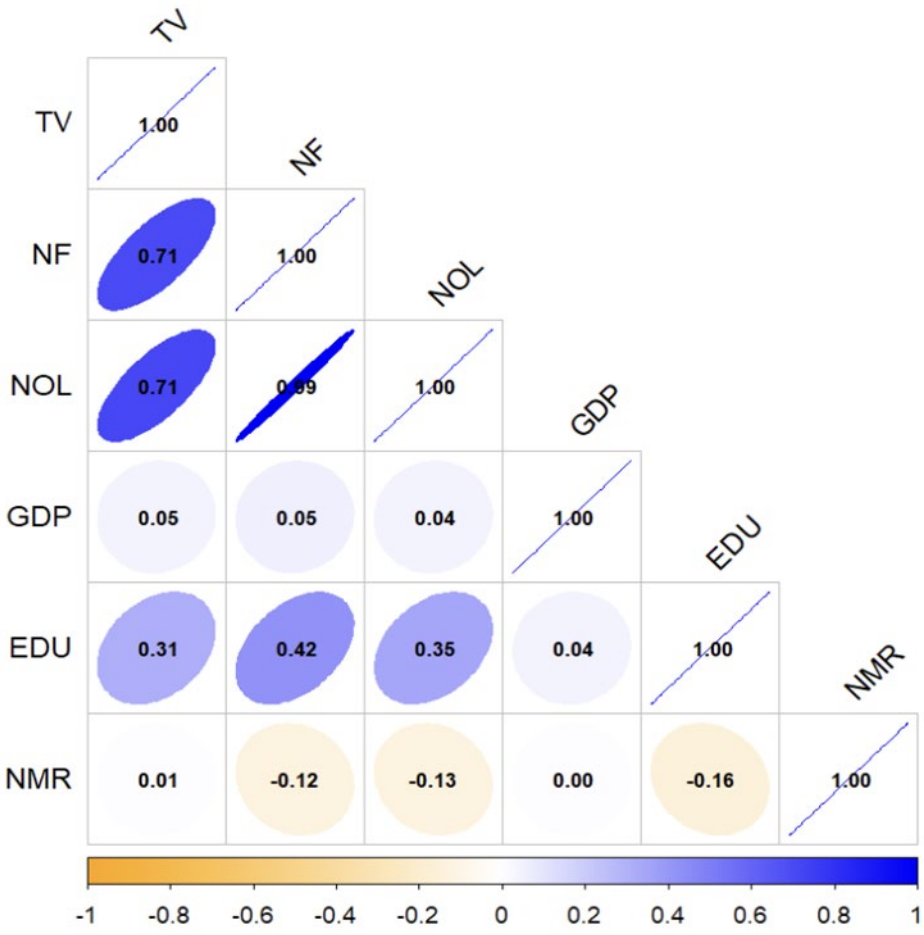
APPENDICES

A. ADDITIONAL TABLES

Appendix A: Correlation Matrix



Appendix B: Results of IPS Test

data: SU~ 1
Wtbar = -17.444, **p-value** < 2.2E-16
alternative hypothesis: stationarity

data: log_TV ~ 1
Wtbar= 0.80864 , **p-value:** 0.7906
alternative hypothesis: stationarity

data: diff_log_TV ~ 1
Wtbar= -2.766 , **p-value:** 0.002837
alternative hypothesis: stationarity

data: NMR ~ 1
Wtbar= -3.5254 , **p-value:** 0.0002114
alternative hypothesis: stationarity

data: log_GDP~ 1
Wtbar= -6.8441 , **p-value:** 3.848E-12
alternative hypothesis: stationarity

data: log_NOL ~ 1
Wtbar= -5.4392E+15 , **p-value** < 2.2E-16
alternative hypothesis: stationarity

data: log_NF ~ 1
Wtbar= -0.73386 , **p-value** : 0.2315
alternative hypothesis: stationarity

data: diff_log_NF ~ 1
Wtbar= 2.3799 , **p-value** : 0.9913
alternative hypothesis: stationarity

data: diff2_log_NF ~ 1
Wtbar= -4.2085 , **p-value** : 1.285E-05
alternative hypothesis: stationarity

data: log_EDU ~ 1
Wtbar= -1.7029 , **p-value** : 0.04429
alternative hypothesis: stationarity

Appendix C: Results of Panel Data Degression (First Differences)

	SU
diff_log_TV	0.0002 (0.001)
diff2_log_NF	0.001 (0.001)
log_NOL	-0.006 ** (0.002)
log_GDP	-0.001 (0.008)
log_EDU	-0.028 *** (0.002)
NMR	0.200 *** (0.062)
Observations	191
R^2	0.51
Adjusted R^2	0.443
F Statistic	28.990 *** (df = 6; 167)

Note: * p<0.1; ** p<0.05; *** p<0.01

B. TURKISH SUMMARY/ TÜRKÇE ÖZET

SERBEST BÖLGELERİN TÜRKİYE'DEKİ YAPISAL İŞSİZLİK ÜZERİNDEKİ ETKİSİ

Giriş

Bu tez, Türkiye'deki serbest bölgelerin (SB) varlığının, küreselleşme ve ticaretteki sert rekabetin etkisiyle şekillenen bir ekonomide yapısal işsizliği etkileyip etkilemediğini belirlemektedir. 1980'lerden bu yana, ihracata dayalı 19 serbest bölge, düşük vergi ve uygun gümrük kuralları ile kalkınmayı ve kazancı teşvik etmiştir. Bununla birlikte, kaynağı beceri uyumsuzluğu, bölgesel eşitsizlik, gençlerin yaşlanması, düşük kadın işgücü seviyeleri ve kayıt dışılık olan yapısal işsizlik, FZ politikası kapsamında kapsamlı bir şekilde araştırılmamıştır. Bu boşluk, 26 NUTS-2 bölgesi üzerinde yürütülen panel teknikleri ve 2013-2023 aralığında HP filtreli işsizlik gelişmeleri ile doldurulmuştur.

Literatür Taraması

Bu literatür taraması, bu tezin temelinde yatan serbest bölgeler ve yapısal işsizlik arasındaki bağlantının teorik ve ampirik ortamını birbirleriyle birlikte incelemektedir. Bu literatür taraması, serbest bölgelerin dünyadaki gelişimine genel bir bakışla başlamakta ve bu bölgelerin yabancı yatırımları arttırmak, ihracatı arttırmak, küreselleşme ve üretimdeki yapısal değişime uyum sağlamada istihdam ve rekabet gücünü arttırmak için bir politika aracı olarak geliştirildiği belirtilmektedir (Feldman & Florida, 1994). Bu modellerin (Serbest Ticaret Bölgeleri, İhracat İşleme Bölgeleri, Özel Ekonomik Bölgeler, vb.) antik Kartaca'dan İrlanda'daki Shannon Serbest Bölgesi'ne ya da Asya'daki günümüz bölgesine kadar farklı ortamlarda önemli olduğu gözlemlenmiştir (Erdoğan & Ener, 2005). Bu bölgelerin teknolojilerin yayılması, işlem maliyetlerinin en aza indirilmesi, yığılma ekonomileri ve firma

düzeyinde üretkenliğin ticaret ağı dışsallıkları açısından faydalı olduğu açıklanmıştır (Porter, 1998).

Türkiye'de serbest bölgelerin oluşumu 1980'lerde ihracata dayalı genişleme planı ile başlamıştır. Bu bölgelerin daha yüksek ticaret seviyelerine, istihdam yaratılmasına ve yabancı yatırımların çekilmesine katkıda bulunmadaki rolü, Danacı ve Koçtürk'ün (2017) yapmış oldukları çalışmada ele alınmıştır. 2023 yılı itibariyle 19 serbest bölge bulunmaktadır. Bununla birlikte, verimsiz yönetim, bölgelerin eşitsiz gelişimi, potansiyellerinin yetersiz kullanımı ve ulusal pazarlara entegrasyon sorunları olarak adlandırılan ve literatürde de açıklanan başka zorluklar da vardır. Bu endişelerin eleştirel değerlendirmesi, yerel ekonomik koşullar, altyapı ve yönetişim kalitesinin bu sonuçların temel aracıları olduğuna işaret eden Akal (2002) ve diğer araştırmacılar tarafından yapılmıştır.

Buna karşılık, literatür taramasının ikinci ekseni, beceri eksikliği, işgücünün bölgeler arasında eşitsiz dağılımı ve sektördeki değişimin neden olduğu işgücü piyasasındaki arz ve talep arasındaki uzun vadeli uyumsuzluk olarak tasvir edilen yapısal işsizliği hedef alacaktır. Herz & Van Rens (2011), Diamond (2013) veya Estevão & Tsounta (2011) gibi akademisyenlerin de vurguladığı gibi, yapısal işsizliğe neden olan geçici şoklar değil, arz tarafındaki katılıklardır. Spesifik olarak, bir yandan ampirik araştırmalar Türkiye ortamında kapsamlı değildir, diğer yandan Şıklar & Bari (2020) yapısal işsizlik tahmini bağlamındaki yorumlarını gözlemlenemeyen bileşen modelleri yardımıyla vermektedir. Uluslararası kuruluşlar tarafından yapılan bir dizi çalışma, yapısal işsizlikle başa çıkmak için belirli işgücü piyasası odaklı reformları, eğitim-uyum ve bölgesel yatırım yaklaşımlarını teşvik etmektedir.

Literatürde yapısal işsizliğin ampirik ölçümünü sağlamak için uygulanabilecek yöntemler arasında NAIRU tahmini, Kalman filtresi ve diğer ayrıştırma metodolojileri yer almaktadır. Mevcut araştırmada, işsizlik serisindeki döngüsel unsurları ve trendi belirleyen Hodrick-Prescott (HP) Filtresi benimsenmiştir. İnceleme, filtrenin metodolojik güçlü yönlerinin (Ravn & Uhlig, 2002) ve sınırlamalarının (Maravall & del Rio, 2001) ortaya konduğu süreci içermektedir. Yine de, bu eleştirilere rağmen, HP filtresi makro-işgücü ekonomisinde ülkeler arası

veya panel araştırmalarında yapısal işsizliği tahmin etmek için tercih edilen bir yaklaşım olarak kabul edilmektedir (Blanchard & Wolfers, 2000).

İncelemeye göre iki temel fikrin kesiştiği nokta, serbest bölgeler ve yapısal işsizliğin etkileşime girdiği son bölümde belirtilmiştir. Aggarwal (2007) ve Miyagiwa (1986) tarafından yapılan çalışma gibi küresel raporlarda serbest bölgelerin ticareti ve yatırımları geliştirerek iş olanakları sağlama potansiyeline sahip olduğu belirtilmekle birlikte, özellikle yapısal işsizlik üzerindeki etkisi yeterince incelenmemiştir. Türkiye örneğinde, belirli bir bölgedeki ihracat performansı veya kalkınma üzerine ampirik araştırmalar daha yaygındır ve serbest bölgelerin beceri veya konum pahasına uzun vadeli işsizliği tatmin etmedeki etkinliği hakkında çok az şey bilinmektedir.

Bu tez, Türkiye'deki serbest bölgelerin 2013-2023 yılları arasında bulundukları bölgede yapısal işsizliği azaltıp azaltamayacağı sorusuna cevap vererek bu boşluğu doldurmaktadır. Serbest bölgelerin ticaretle ilgili göstergelerinin ve eğitim düzeyi, göç ve GSYİH gibi bölgesel sosyo-ekonomik faktörlerin yanı sıra HP filtreleme ve panel ekonometrik yaklaşımların (örneğin; FE ve GMM) dahil edilmesi, araştırmanın mevcut literatüre kıyasla daha odaklı ve dolayısıyla politika ile ilgili sonuçlar üretmesini sağlayacaktır. Bu süreçte, bölgesel kalkınma ve çalışma ekonomisi literatürüne hem teorik hem de metodolojik katkılarda bulunmaktadır.

Metodoloji

- **Araştırma Tasarımı**

Bu çalışmada, serbest bölgelerin 2013-2023 döneminde Türkiye'deki 26 bölgede yapısal işsizliği nasıl etkilediğini tartışacağız. Türkiye'deki 26 Düzey 2 bölgesi 2013-2023 zaman aralığında incelenmiştir. Yapısal işsizlik kolaylıkla ölçülebilir olmadığından, HP filtresi aracılığıyla toplam işsizlik serisine karşı trend (yapısal) çıkarılmıştır. Uygulanan panel veri yöntemi, serbest bölge göstergeleri ile işsizliğin uzun vadeli trendi arasındaki korelasyonu zaman ve kesit boyutu uygulayarak test etmiştir.

- **Veri Toplama ve Değişkenler**

Mevcut araştırmada, istatistikler TÜİK ve Türkiye Ticaret Bakanlığı Serbest Bölgeler Müdürlüğü'nün yardımıyla toplanmıştır. Kritik yapısal işsizlik bu çalışmada HP Filtresi kullanılarak tahmin edilmiştir. Serbest bölgeleri ifade eden başlıca ölçütler ticaret hacmi, şirket sayısı ve faaliyet ruhsatıdır. Bunların yanı sıra, gayri safi yurtiçi hasıla, eğitim seviyesi ve göç oranı olmak üzere üç değişken daha kontrol değişkenleri olarak tanıtılmıştır. Eğitim bir eşleşme biçimi, göç ise işgücü hareketliliği biçimidir. Veri seti, gözlem eksikliği nedeniyle dengeli olmayan bir panele sahiptir, bu nedenle kayıp zaman serisi yöntemleri uygulanmıştır.

- **Yapısal İşsizliğin Tahmini**

HP Filtresi işsizlik serilerini uzun dönem trendi (yapısal işsizlik) ve kısa dönem olarak ayırır. HP Filtresi matematiksel formülasyonu, trend ve trend bileşeninin ikinci dereceden farklarının karesel sapmalarının ağırlıklı bir toplamının minimize edilmesini gerektirir. Düzeltme parametresi (λ) 100'dür ve yıllık veriler tarafından önerilmektedir.

- **Ekonometrik Model ve Spesifikasyon**

Bu çalışmada, 2013-2023 yıl aralığında Türkiye'nin 26 NUTS-2 bölgesine ait dengesiz panel veri kullanılmıştır. Çalışmanın yapılmasının ardındaki temel neden, serbest bölge faaliyetlerinin yapısal işsizlik üzerindeki uzun vadeli etkilerini ölçmektir. Burada, işsizlik serisinin trend bileşeni çıkarılmış ve yapısal işsizliği oluşturan kalan seri modellenmiş ve her bir bölge için HP filtresi kullanılarak bağımlı değişken olarak ele alınmıştır. En büyük açıklayıcı değişkenler serbest bölgelerin ticaret hacmi (log_TV) , bölgelerdeki firma sayısı (log_NF) veya faaliyet ruhsatı sayısıdır (log_NOL). Bu değişkenler serbest bölgelerin finansal derinliği ve kurumsal performansıdır. Kontrol değişkenleri bölgesel gayrisafi yurtiçi hasıla (log_GDP), eğitim seviyesi (log_EDU) ve net göç oranını (NMR) içerecektir. Net göç oranı, işgücünün kaynağının ve bölgesel düzeyde işlerin mevcudiyetinin çeşitli sonuçlarını yakalamak için modele eklenmiştir.

Modelin genel formu aşağıdaki gibi belirlenmiştir:

$$SU_{it} = \propto + \beta_1 \log\_TV_{it} + \beta_2 \log\_NF_{it} + \beta_3 \log\_NOL_{it} + + \delta_1 \log\_GDP_{it} + \delta_2 \log\_EDU_{it} + \delta_3 NMR_{it} + \lambda_t + \varepsilon_{it}$$

Burada; SU_{it} yapısal işsizlik oranını, λ_t zaman sabitlerini ve ε_{it} hata terimini temsil etmektedir. Değişkenler arasındaki ilişki logaritmik dönüşüm yoluyla esneklik formatında ölçülebilmektedir ve istisnai değerlerin etkilerini en aza indirmek ve karşılaştırılabilir hale getirmek için bu tür bir dönüşüm de tercih edilmiştir.

Modeli tahmin etmek için sabit etkiler yaklaşımı kullanılmıştır. Hausman testi nedeniyle sabit etkiler modelinin kullanılması tercih edilmiştir; bu durumda serbest bölgelerin etkileri bölgesel sabit heterojenliğe bölünmektedir. Ayrıca, hata terimlerinin otokorelasyon ve değişen varyans alternatiflerini test eden Breusch-Godfrey ve Pesaran CD testleri kullanılmıştır. Sapmaları ortadan kaldırmak için sağlam ve kümelenmiş standart hatalar kullanılmıştır.

Burada; SU_{it} t yılında bölgedeki yapısal işsizlik, log $\_TV_{it}$ t yılında bölgedeki serbest bölgelerin ticaret hacmi, log $_NF_{it}$t yılında bölgedeki serbest bölgelerdeki firma sayısı, log $\_NOL_{it}$ t yılında bölgedeki faaliyet ruhsatı sayısıdır, log $\_GDP_{it}$ bölgelerin gayrisafi yurtiçi hasılası, log $\_EDU_{it}$ bölgelerin t zamanındaki eğitim seviyesidir, ve NMR_{it} '(alınan göç-verilen göç)/nüfus' ile bulunan net göç oranı, δ kontrol değişkenleri için katsayılar vektörü, λ_t zaman etkisi ve ε_{it} hata terimidir. ε_{it}' nin içerdiği değişkenler, kısmen görünür bölgesel kültürel farklılıklar ve yerel olarak yönetilen yönetim altyapılarındaki tutarsızlıkları içerdiklerinden çok büyüktür. Bu özelliklerin belirsizliği, artıkların beyaz gürültü olduğu yönündeki sıfır hipotezinin neden kontrol edilmesi gerektiğini gösterir. Ayrıca, model belirli bölge-yıl kombinasyonlarında meydana gelen politika şokları veya türbülanslı sermaye girişleri tarafından ortaya çıkarılan beklenmedik dışsal etkileri açıkça içerir. Böyle bir çerçeve, tarafsız çıkarımlar sağlar ve sonuçların politika karar vericileri için güvenilirliğini güçlendirir.

Ana açıklayıcı değişkenler olan ticaret hacmi, firma sayısı ve faaliyet ruhsatı sayısı, her bir serbest bölgedeki ekonomik faaliyet ve kurumsal gelişimin boyutunu göstermek amacıyla seçilmiştir. Ticaret hacmi, ticari faaliyetlerin ve küresel piyasalara açıklığın derecesini göstermektedir. Ticaret miktarındaki bir artış daha fazla ekonomik entegrasyona işaret edebilir ve açıklık açısından yüksek puan alan bölgeler üretim ve ihracat teşvikleri nedeniyle istihdam yaratılmasına olanak sağlayabilecektir. Bu beklenti, Aggarwal'ın (2007) ihracata yönelik bölgelerin firmaları çekmenin yanı sıra geriye ve ileriye doğru bağlantılar oluşturarak istihdam üzerinde olumlu bir etkiye sahip olduğunu bildirirken yaptığı katkıyla benzerlik taşımaktadır. Firma sayısını da dahil etmektedirler çünkü bu aynı zamanda serbest bölge girişimciliğini, yığılma etkilerini ve her bir bölgedeki iş dinamizmini de belirlemektedir. Feldman ve Florida (1994), firmalardaki mekânsal yoğunlaşmanın işgücünün özümsenmesine ve bilgi yayılımının artmasına yardımcı olduğuna, bunun da işgücündeki yapısal uyumsuzluğun azaltılmasını sağlayabileceğine işaret etmektedir.

Bir bölgede verilen faaliyet ruhsatlarının miktarı düzenlemelerin yoğunluğunu gösterdiğinden, düzenleyici ve idari yoğunluğun bir göstergesi olabilirler. Serbest bölgelerin ekonomisine katılmak için kurumlara erişimi, yatırımcıların katılımını ve yasal sistemi gösterir. Kötü yönetişim ve bu bölgelerdeki yatırımcılara dostane olmayan politikalar zararlı olabilir, ancak Acar ve Gültekin-Karakaş'ın (2017) belirttiği gibi, daha iyi yönetişim ve yatırımcıların lehine olan politikalar bürokrasideki sürtüşmeyi azaltabilir, istihdam kabiliyetini artırabilir ve yapısal işsizlik sorununu hafifletebilecek faktörler olan kurumların verimliliğini artırabilir. Uluslararası ticaret hacmindeki büyüme, üretim faaliyetindeki büyümenin göstergesidir ve bu da lojistik, depolama ve sigorta gibi tamamlayıcı sektörlerdeki istihdamın artmasına neden olur.

Firma sayısı, ölçek ekonomilerinin ve Ar-Ge kümelerinin kaba bir temsilcisidir, ancak otomasyonun istihdam üzerindeki etkileri, yüksek firma sayısının düşük istihdam seviyeleriyle bir arada bulunabileceğini gösterdiğinden, ekonomi düzeyinde firma sayısının belirleyicilerini araştırmak ilginçtir. Buna karşılık, yapısal model, firma sayısı ve genel istihdam arasındaki belirsiz korelasyonu korur ve işletme

lisanslarının miktarı, yönetişim kalitesinin göstergesi olarak kullanılabilir. Dolayısıyla, potansiyel yatırımcıların girişine izin vermek için çok bürokratik olan sınırlı lisans verme politikaları nedeniyle istihdamlar engellenebilir.

Yapısal işsizliğin diğer sosyo-ekonomik belirleyicileri kontrol değişkenleri şeklinde modele dahil edilmiştir. Bir bölgedeki GSYİH büyümesi, Okun Yasası uyarınca bölgedeki işsizlik seviyesi ile ters orantılı olacaktır; bu yasaya göre çıktı büyümesindeki yukarı yönlü bir kayma genellikle istihdamda artışa neden olmaktadır. Bu durum gelişmekte olan ülkelerde her zaman geçerli değildir ve bunun nedeni büyümenin sermaye yoğun endüstriler tarafından desteklenmesi ya da işgücü piyasasının hala oldukça esnek olmaması olabilir.

Çalışmamıza eğitim düzeyi, beşerî sermayenin kalitesini yakalamak için dahil edilmiştir ve yükseköğretime dayalı eğitim kazanımının daha güçlü olduğu bölgelerin işgücü arz ve talebini ayarlamak için daha iyi bir konumda olacağı varsayılmaktadır. Herz ve Van Rens'e (2011) göre, eğitim seviyesi yükseldikçe beceri uyumsuzlukları azalmakta, dolayısıyla yapısal işsizlik ortadan kalkmaktadır.

Öte yandan, bölgelerdeki ölçülen işgücü hareketliliğinin vekil bir göstergesi net göç oranıdır (NMR). Göç aynı zamanda işgücü arz ve talebini de etkilemektedir; girişlerin yeterli sayıda iş sağlanmasıyla dengelenmesi durumunda olumlu, bölgede yaratılan iş sayısına kıyasla girişlerin çok hızlı olması durumunda ise olumsuz bir etkiye sahiptir. Bu değişken, göç kalıplarının fırsat temelli veya sıkıntı temelli olması durumunda her iki işarete de sahip olabilir. Ampirik bulgular, GSYİH büyümesi ile işsizlik arasındaki bağlantının, sektörler arasındaki büyümenin dağılım profili aracılığıyla gerçekleştiğini göstermektedir. Özellikle, sermaye yoğun bir büyümenin işgücü piyasası esnekliğini azaltması muhtemeldir, ancak imalat-ihracat odaklı büyümenin işgücüne olan talebi artırması muhtemeldir. Eğitimin işsizlik üzerindeki etkisinin bölgesel endüstriyel yapı ile bir sentez oluşturduğunu belirtmek ilginçtir: lisansüstü eğitim, bilgi tabanlı bölgesel ekonomilerde işgücü piyasası fırsatlarını azaltırken, mesleki eğitim, tarım ekonomilerinde bölgesel istihdamı teşvik eder. Bu bağlantının üçüncü aracısı, ülkeler arasındaki net göçtür ve bu da hem bir arz şoku hem de insan sermayesi kazanımlarının kaynağı olarak işlev görür.

Sabit etkilerin spesifikleştirilmesi, coğrafya, altyapı kalitesi ve tarihi sanayi tabanı dahil olmak üzere bölgeye özgü, zamanla değişmeyen yapının regresörlerle ilişkili olması en muhtemel faktörler olduğunu gösteren Hausman testinden sonra uygun görülmüştür. Kontrol, önceki gözlemlenemeyen heterojenlik nedeniyle katsayıların yansız ve daha tutarlı tahminlerini sunmuştur. Hausman testi sonuçları, liman erişimi, yol altyapısı ve geçmişteki endüstriyel kümelenmeler gibi bölgeler arasında ortak olan değişkenlerin regresörlerle ilişkili olduğunu ortaya koymaktadır. Bu istatistiksel sonuca dayanarak, sabit etkiler modelinin seçimi yalnızca doğrulanmakla kalmamakta, aynı zamanda Türkiye'deki bölgesel kalkınma üzerine literatürde öne sürülen teorik varsayımlarla da tutarlıdır. Eşit derecede önemli olarak, sabit etkiler modeli, serbest bölge performans değerlendirmesine göreli yerleşim avantajı kavramının özel olarak dahil edilmesiyle mekânsal dışsallıkları içselleştirmektedir.

Ters nedensellik ve içselliğin ihmal edilen değişken yanlılığı sorunları, sağlamlığı arttırmak için prosedürler olarak Arellano-Bond dinamik GMM tahmincisi kullanılarak kontrol edilmiştir. Bu yaklaşım, gecikmeli enstrümanların ve fark almanın kullanılması nedeniyle otokorelasyon ve eşzamanlılık sorunlarını önlemede etkili olmuştur. Eşzamanlılık sorununu aşmak için, endojen değişkenlerin gecikmeli gözlemlerini araçsal değişkenler olarak kullanırız, dolayısıyla tahmini model Arellano-Bond GMM tahmincisidir. Bu yöntem, Serbest Bölge (FZ) teşviklerinin hem ticaret seviyesini hem de istihdamı aynı anda etkileyebileceği politika etkileşimlerinin modellenmesi söz konusu olduğunda özellikle avantajlıdır. Politikanın zamanla değişen etkilerini yeniden yapılandırmak için yinelemeli yörüngeler aracılığıyla, GMM tahmincisi nedensellik ilişkilerinin daha spesifik bir tanımına olanak sağlar.

Bu makalede kullanılan ekonometrik model, serbest bölgelerin yapısal işsizlik üzerindeki etkisini belirleyip ölçebilen ve aynı zamanda bölgesel farklılıkları, makroekonomik şokları ve işgücü piyasalarının diğer temel yönlerini kontrol edebilen katı bir araştırma çerçevesidir. Böyle bir çerçevenin uygulanması yoluyla bu çalışma, mekânsal olarak sınırlandırılmış sanayi politikası araçlarının, yani serbest bölgelerin, kapsayıcı işgücü piyasası geliştirme araçları olarak nasıl kullanılabileceğine ilişkin akademik araştırmalara katkıda bulunmaktadır. Mevcut

araştırma metodolojik olarak serbest bölgeleri, araştırmasının ampirik temelde olduğundan emin olmak için makro-mikro köprü inşasının zorluklarına maruz bırakmaktadır. Konunun değerlendirilmesinde bölgesel heterojenliğin açıkça dikkate alınması, yönteme ampirik sağlamlık sağlamakta ve tek vaka çalışmalarına dayalı genelleştirilmiş sonuçlar çıkarma olasılığını ortadan kaldırmaktadır. Aynı zamanda, çerçeve çeşitli yönetişim düzeylerinde faaliyete açılabilecek politika alanlarını ayırt etmektedir yani ulusal düzeyde ihracat finansmanı teşvikleri bölgesel düzeyde mesleki eğitim programlarıyla birleştirilebilir. Bu çok katmanlı hükümet modeli altında serbest bölgelerin işgücü piyasası etkileri eleştirel bir şekilde sorgulanmaktadır.

- **Tanısal ve Ekonometrik Testler**

Modeli tahmin etmek için sabit etki modeli kullanılmıştır. Hausman testi sabit etkileri ima etmiştir. Otokorelasyonun test edilmesinde Breusch-Godfrey testi ve yatay kesit bağımlılığında Pesaran CD testi kullanılmıştır. Heteroskedastisite sorunu ile karşılaştırıldığında sonucu sağlam ve kümelenmiş standart hatalar kullanarak tahmin etmişlerdir.

Dinamik etkiler Arellano-Bond GMM tekniği kullanılarak ölçülmüştür. Bu yöntem, gecikmeli bağımlı değişkenin varlığı, içsellik ve hata terimlerinde seri korelasyon olasılığı ile ilgilenmiştir. Araç geçerliliği Sargan ve Hansen testleri kullanılarak yapılmıştır. Pozitif korelasyon testi AR(1) ile analiz edilirken, modelin geçerliliğini analiz etmek için AR(2) testi yapılmıştır.

Dahası, modelin istikrarını ve katsayıların güvenilirliğini belirlemek için IPS birim kök testi kullanılmıştır. Dengesiz panel yapısına göre değişkenlerin durağanlık durumunu test ettiği için uzun dönem analiz potansiyeli IPS testi ile desteklenmiştir.

- **Sınırlamalar**

Bu çalışma, birkaç veriyle ilgili ve metodolojik kısıtlamayla mücadele etmektedir. Birincisi, Türkiye'de bazı serbest bölgeler 2008'den 2012'ye kadar yıllık olarak

gözlemlenmemiştir, bu da zaman aralığının 2013-2023'e kısaltılmasını zorunlu kılmıştır. İkincisi, tüm ülkede 19 serbest bölge olmasına rağmen, veri eksikliği nedeniyle Doğu Anadolu Serbest Bölgesi verilen verilere dahil edilmemiştir. Üçüncüsü, eğitim ve göç değişkenlerinin bileşimi, ilk veri setinin parçalanmış olması nedeniyle büyük ölçekli manuel toplamayı gerektirmiş ve böylece daha açıklayıcı değişkenlerin eklenmesini engellemiştir. Bu eksikliklere rağmen, analitik çerçeve, ampirik kanıtların sağlamlığını ve iç geçerliliğini korumak için oluşturulmuştur. İstenilen verilerin eksikliği, Türkiye'nin az gelişmiş bölgelerinden biri olan Doğu Anadolu Serbest Bölgesi'ndeki yapısal işsizliği karakterize etmeyi zorlaştırmaktadır. Kurumsal kaynaklar arasındaki veri formatlarındaki farklılıklar, göç ve eğitim göstergelerinin manuel olarak entegre edilmesi gerektiği anlamına geliyordu ve bu da ölçüm hatası olasılığını artırıyordu. Bu kısıtlamalara rağmen, çalışma çeşitli kaynakların değişkenlerinin üçgenlenmesi yoluyla verilerin uyumunu artırmaya çalıştı. Araştırmanın gelecekte firma ve çalışan düzeyindeki verileri birleştirerek modelleme çerçevesinin tahmin gücünü artırması muhtemeldir.

Bulgular

Tez araştırması, çeşitli bölgeleri ve çalışma yıllarını temsil eden dengesiz bir panel verisi kullanarak serbest bölgelerin Türkiye'deki yapısal işsizliğe olan etkilerini inceler. Sabit etkiler (FE), dinamik sabit etkiler ve genelleştirilmiş momentler yöntemi (GMM) gibi çoklu yöntemli ekonometri kullanarak araştırmacı, serbest bölgelerin faaliyet gösterdiği Türkiye bölgeleri genelinde işgücü piyasasının sonucunu belirlemede ticaret hacmi, firma sayısı, lisanslama, eğitim, GSYİH ve göçün etkisini analiz eder.

- **Sabit Etkiler Modeli**

Bu çalışma, Türkiye'deki serbest bölgelerin yapısal işsizliğe nasıl katkıda bulunduğunu araştırmak için dengesiz panel veri analizi tekniğini kullanmaktadır. Bilgiler, 2013-2023 döneminde bilgilerde temsil edilen 26 alt bölgeyi (NUTS-2) ve 18 serbest bölgeyi temsil etmektedir. En uygun modeli seçmek için öncelikle Hausman testi uygulanmış ve istatistiksel olarak anlamlı bulgular elde edilmiştir ($p <$

0.001, χ^2 = 52.026). Bulgular, sabit etkiler (FE) modelinin, rastgele etkiler (RE) modelinin ürettiği tahminlere kıyasla daha sağlam ve güvenilir tahminler ürettiğini göstermektedir; çünkü ikinci modelin, ortogonallik koşulunu bozduğu için birincisinin ürettiği çıkarımlar kadar tutarlı çıkarımlar üretmesi olası değildir ve bu nedenle bireysel etkilerin açıklama değişkenlerinden arındırılmaması durumunda tahminleri tutarsız olabilir. FE modeline dayanarak, mevcut revizyon serbest bölgelerdeki ticaretin (log_TV), çalışma izni sayısının (log_NOL) ve il sakinlerinin eğitim düzeyinin (log_EDU) yapısal işsizlik üzerinde negatif ve istatistiksel olarak anlamlı bir etkiye sahip olduğunu göstermektedir. Özellikle, log_EDU her iki modelde de en güçlü ve en sabit bağlantıyı sunan değişkendir, bu da daha yüksek beşeri sermayenin işgücü piyasalarındaki arz talep uyumsuzluğunu azalttığını, dolayısıyla genel olarak işgücü piyasasında esnekliği artırdığını ve beşeri sermaye teorisine dayanan açık çıkarımlara uygun olarak yapısal işsizliği önlediğini göstermektedir. Net göç oranı (NMR) değişkeninin de farklı bölgeler üzerinde farklı etkileri vardır ve bu da yapısal işsizlik üzerindeki etkisiyle ilgili olarak mekansal heterojenliğe sahip olduğunu göstermektedir. İşgücü talebinin düşük olduğu bir ortamda, işgücü girişi aşırı arz yaratabilir ve dolayısıyla işsizliği şiddetlendirebilir; işgücü kıtlığının olduğu bir bölgede, bir alana göç piyasa dengesinin yaratılmasına yardımcı olabilir.

Öte yandan, serbest bölgelerdeki firma sayısının logaritmasının (log_NF) ve bölge GSYİH'sinin (log_GDP) yapısal işsizlik üzerinde istatistiksel olarak önemli etkileri yoktur. Bu veriler, serbest bölge ortamındaki şirketlerin basit niceliksel genişlemesinin yeterli olmadığını, asıl sorulması gereken sorunun bu işletmelerin üretim ve işgücü istihdamı açısından gerçekten proaktif olup olmadıkları olduğunu göstermektedir.

Model uyumunun sistemik incelemesinin sonuçları R^2= 0,531 ve düzeltilmiş R^2=0,467 olduğunu gösterecektir, bu da yapısal işsizliğin %53'ünün açıklayıcı değişkenler topluluğu tarafından açıklandığı anlamına gelmektedir. İlgili F-istatistiği (31.896, $p < 0.001$) anlamlıdır.

Bununla birlikte, Breusch-Godfrey testi sabit etkiler modelinin hatasında birinci dereceden seri korelasyonu tanımlamaktadır ($p < 0.001$). Dolayısıyla, ortaya çıkan

otokorelasyon, genelleştirilmiş momentler yönteminin (GMM) heteroskedastik-sağlam standart hatalarıyla kullanılan ArellanoBond tahmin süreci aracılığıyla etkisiz hale getirilmiştir. Bu yeniden spesifikasyonda, log_TV , log_NOL ve log_EDU değişkenlerinin istatistiksel olarak anlamlı olmaya devam ettiği ve dolayısıyla yapısal işsizlik üzerindeki etki sonuçlarının modelin düzeltilmesine karşı dirençli kaldığı görülmüştür. Tüm model spesifikasyonlarında log_NF ve log_GDP anlamlı değilken, net göç oranı değişkeni istatistiksel çekim gücünün sınırlarında yer almaktadır. BreuschPagan testi (p = 0.1266) değişen varyansın bir sorun olmadığını gösterirken Pesaran CD testi (p = 0.6429) çapraz bağımlılık olmadığını göstermektedir. Tüm bu bulgular tahmin edilen katsayıların meşruiyetini teyit etmekte ve kanıtların mevcut spesifikasyonun temel varsayımlara uygunluğunu gösterdiği sonucuna varılmasına izin vermektedir.

Mevcut sonuçlar, çok sayıda ampirik çalışma ile desteklenmektedir. Özellikle, daha önce UNCTAD (2021) tarafından ortaya konan serbest ticaret bölgesinin sadece ekonomik faaliyetlerin büyümesini değil aynı zamanda istihdamı da teşvik ettiği gerçeği pekiştirilmiştir. Ayrıca, eğitimin yapısal işsizlik üzerindeki azaltıcı etkisi, Blanchard & Wolfers (2000) tarafından sunulan uyum teorisi ile klasik işgücü piyasası kavramıyla da tutarlıdır. Göç ve yapısal işsizlik arasındaki ilişki ise, bölgesel eşitsizliklere ve işgücü piyasasıuyum kapasitesine vurgu yapan bölgesel iktisat ile uyumludur.

Sonuç olarak, Türkiye'nin serbest bölge politikasının yapısal işsizliği azaltması için sadece şirketler listesine isim eklemeye değil, aynı zamanda nitelikli yatırımı artırmaya, eğitim sistemini güçlendirmeye ve işgücü piyasası ve bölgedeki politikaları düzenlemeye odaklanılması gerekmektedir. Uygun bir politika çerçevesi ile birleştirildiğinde, serbest bölgeler yapısal işsizliği ortadan kaldırma potansiyeline sahip değildir, ancak genel stratejide belirleyici bir rol oynayabilirler.

- **Panel Birim Kök Testleri**

Mevcut çalışmamızda, gözlemlenemeyen heterojenliği nispeten iyi bir şekilde minimize etmeye yardımcı olduğu için panel veri analizi yaparken tercih edilen

spesifikasyon olarak sabit etkiler tahmincisini kullanmaya karar verdik. Bu çerçevede, çalışma takvim yıllarına göre değişmeyen bireysel etkileri yakalayabilmiş ve böylece bölgelerin yapısal işsizlik üzerindeki etkisini ölçme fırsatı sunmuştur. Ampirik analiz, birimlerin zaman içinde bağımlılığını ima eden hata terimlerinde seri korelasyon olduğunu göstermiştir. Ancak yatay kesit bağımlılığında uygulandığı gibi gruplar arası veya grup içi bağımlılık tespit edilmemiştir. IPS panel birim kökü daha sonra modelin sağlamlığını artırmak amacıyla durağanlığı test etmek için kullanılmıştır. IPS tarafından sağlanan durağanlık testi yapısal işsizlik (SU), log_NOL, log_GDP, log_EDU ve NMR'nin I(0) seviyesinde olduğunu ancak log_TV ve log_NF'nin olmadığını desteklemiştir. Bu nedenle, log_TV'nin birinci farkları (diff_log_TV) ve log_NF'nin ikinci farkları (diff2_log_NF) ilave regresörler olarak eklenmiştir. Farkları alınmış değişkenlerin kullanımı kısa vadeli değişimlerin etkisini aydınlatmakta ancak seviye etkilerinin ihmal edilmesi nedeniyle açıklayıcı gücü azaltmaktadır.

Yapmış olduğumuz panel verilerinin sabit etkiler modeline dayalı analiz, log_NOL'un ve log_EDU'nun yapısal işsizlik üzerinde anlamlı bir negatif etkiye sahip olduğunu, ancak NMR'nin pozitif anlamlı bir etki gösterdiğini ortaya koymuştur. Buna karşın, log_TV ve log_NF'nin farklılaştırılmış versiyonları anlamlı değildir. Bu bağlamda, log_TV'nin düzey formunda anlamlı olarak gösterilip farklılaştırılmış formda anlamlı olmamasının açıklaması söz konusudur. Seri korelasyon etkisinin ortadan kaldırılması, seviye etkisinin ortadan kaldırılması ve dengesiz (panel) yapı nedeniyle açıklayıcı gücün azalması olmak üzere üç faktör öne sürülmüştür.

Yapısal işsizliğin oldukça ikna edici bir açıklaması olduğu düşünülmesine rağmen teorik katsayı (R^2) %51'dir. Sırasıyla Breusch-Godfrey testi, Breusch-Pagan testi ve Pesaran CD testi gibi tanısal testler kullanılarak seri korelasyon, düşük düzeyli değişen varyans ve birimler arasında çapraz bağımlılık bulunmamıştır. Modelin dinamik yapısının daha iyi bir şekilde kaydedilmesi için lag_SU değişkeni dahil edilmiş ve sabit etki modeli yeniden tahmin edilmiştir; sonuçlar lag_SU ve log_EDU değişkenlerinin anlamlı olduğunu göstermiştir. Lag_SU'nun katsayısının 1'e yakın olması, Türkiye'de yapısal işsizlik sorununun da büyük olduğunu gösterirken,

log_EDU katsayısının pozitif işareti, işgücü piyasasında yapısal dengesizlik yaratma ve beceri uyumsuzluğunun olası nedenleri nedeniyle daha fazla eğitimin etkisinin yapısal işsizliği etkileyebileceğini ortaya koymaktadır.

Son olarak, daha tutarlı tahminler elde edebilmek adına çalışmada , Arellano ve Bond (1991) tarafından önerilen model ile Genelleştirilmiş Momentler Yöntemi (GMM) kullanılmıştır. Gecikmeli bağımlı değişken kullanımı GMM tahmincisini içsellik ve otokorelasyona karşı daha az oynak hale getirmekte, böylece orijinal GMM modelinde fark edildiği üzere ikinci dereceden otokorelasyonun varlığından kaçınılmaktadır. Yeniden tahmin sırasında, bağımlı değişkenin ikinci gecikmesi dahil edilerek otokorelasyon sorunu giderilmektedir. GMM-2 modelinin değerlendirilmesiyle ilgili olarak, gecikmeli değişkenler lag_SU, log_GDP ve log_EDU'nun yapısal işsizlik üzerinde önemli bir etkiye sahip olduğu söylenebilir. Birbirlerine kıyasla göreli konumların bu analizi, literatürle uyumlu veri bilgisinin, tahminleri sabit etkiler ve havuzlanmış OLS modellerinin tahminleri olan sistemler arasında bir tür orta konumda yer alan GMM tarafından üretilen tahminlerin karşılaştırılmasının sonuçlarına yansımaktadır. Dolayısıyla GMM tekniği, yapısal işsizliğin teorik iddiaları ve ampirik gerçeklerle en tutarlı olan teknik olarak konumlandırılmaktadır.

- **Serbest Bölgelerin Yapısal İşsizlik Üzerine Etkisi**

Bu çalışma, 2013-2023 yılları arasında Türkiye'de serbest bölgelerin yapısal işsizlik üzerindeki etkisini sabit etkiler modeliyle incelemektedir. Sonuçlar, serbest bölgelerin çeşitli bölgelerde farklı etkileri olduğunu göstermektedir. İstanbul (TR10) ve İzmir (TR31) gibi bölgelerde pozitif yapısal işsizlik yayılma etkileri bulunurken, TR21 ve TR41 gibi bölgelerde iş döngüsü şokları daha güçlüdür. Dahası, etkiler aynı bölgede bulunan çeşitli serbest bölgelerle karşılaştırıldığında bile farklılık gösterebilmektedir, bu da bölgesel ekonomi ve politikaların etkisini göstermektedir. Tıpkı TR90 bölgesinde olduğu gibi, serbest bölgelerde de mikro düzeydeki politika farklılaşması ve sektör penetrasyonu önem taşımaktadır. Bu nedenle, serbest bölgelere ilişkin bu tür politikalarda tekdüzelikten uzaklaşılarak, bölgesel gerekliliklere göre formüle edilmeleri önerilmektedir. Çalışmada, Türkiye'deki

serbest bölgelerin yapısal işsizliği etkileyip etkilemediği sorusuna, coğrafi bölgelere yönelik heterojenlik göz önünde bulundurularak derinlemesine bir yanıt verilmektedir.

- **Bağlamdaki Bulgular: Mevcut Literatüre Bağlantı**

Porter (1998) tarafından açıkça tanımlanan bölgesel rekabet gücü teorisi, ampirik kanıtlarla ve Rodriguez-Clare'in (1996) firma düzeyindeki yeniliğin serbest bölgelerin varlığıyla tetiklendiği iddiasıyla desteklenmektedir. Eğitimsel önem, Herz & Van Rens (2011) ve Diamond (2013) tarafından kanıtlandığı gibi, yapısal işsizliğin azaltılmasını sağlamada insan sermayesi politikasının gerekliliğini destekleyen işgücü uyumsuzluğu teorisiyle tutarlıdır. Lisanslamanın faydalı etkisi, Aggarwal'ın (2007) serbest bölgelerdeki firmaların faaliyetlerinin istihdamı teşvik ettiği yönündeki argümanını desteklerken, göçün belirsiz etkisi, Tsounta'nın (2011) demografik değişiklikler sırasında işgücü piyasası uyumsuzluğunun olumsuz doğası hakkındaki uyarısını yansıtmaktadır.

Ek olarak, kaydedilen bölgesel heterojenlik, Danacı (2017) ve altyapı ve sektörel kompozisyonun kurumsal kapasiteyle birlikte serbest bölgelerin başarısını belirlemede etkili roller oynadığını belirten Koçtürk (2017) tarafından yapılan varsayımları desteklemektedir. HP Filtresinin yapısal işsizliği ayırmada kullanılması, Blanchard ve Wolfers (2000) tarafından benimsenen yaklaşım söz konusu olduğunda metodolojik olarak sağlam değildir, ancak eleştiri konusu olmuştur (Maravall & del Rio, 2001).

Sonuç

Türkiye'de serbest bölgelerin varlığının 20132023 yapısal işsizlik üzerindeki sonuçları sabit etkiler modelleri, panel birim kök testleri ve dinamik GMM yardımıyla incelenmiştir. Sonuçlar, ticaret miktarının ve ticaretin yol açtığı ruhsat sayısının yapısal işsizliği her zaman düşürdüğünü, ancak bunun bireysel olarak faaliyet gösteren firma sayısı tarafından alınan önlemler üzerinde önemli bir etkisi olmadığını göstermektedir. Büyük miktarda beşerî sermayenin bulunduğu bölgelerde işgücünün uyumu daha fazla olmakta ve yapısal işsizlik miktarı azalmaktadır; ancak

büyük miktarda göç olduğunda bunun tam tersi olmaktadır. Bu durum, yapısal işsizliğin oldukça uzun ömürlü olduğunu ve modelin dinamik tahmininde gösterildiği gibi önceki dönemin güçlü bir etkisine sahip olduğunu göstermektedir. Serbest bölgelerin etkisi bölgesel düzeyde Istanbul veya Adana-Mersin gibi gelişmiş sanayi merkezlerinde büyükken, Tekirdağ-Edirne-Kırklareli gibi diğer bölgelerde bu etki o kadar derin değildir. Bu durum, SB politikalarının bölgesel altyapı, çeşitlilik, sektörün ve yerel yönetimin kapasitesi ile birlikte ele alınması gerektiğini göstermektedir.

Politika önerileri, ticareti teşvik eden ruhsatların verilmesiyle ilgili prosedürlerin desteklenmesine, bölge düzeyinde beceri eğitiminin oluşturulmasına ve bir bölgedeki işgücü arz ve talebi arasındaki dengenin izlenmesine dayanmaktadır. Serbest bölgelerin dijitalleşme ve yeşil yatırımlarla birleştirilmesi, istihdam açısından daha önemli bir uzun vadeli etki geliştirilmesinde önemli bir rol oynamaktadır. Bir başka bulgu, HP filtresi ile ölçülen yapısal işsizlik modellerinin, politikaların oluşturulmasında esas olarak uygulanabilir olduğunu göstermektedir.

Sonuç olarak, Türkiye'deki serbest bölgeler, stratejik ticaret ve beşeri sermaye yatırımlarıyla desteklendikleri takdirde yapısal işsizliğin azaltılmasında önemli bir rol oynama potansiyeline sahiptir.

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