

**T.R.**  
**GEBZE TECHNICAL UNIVERSITY**  
**INSTITUTE OF SOCIAL SCIENCES**

**ESSAYS ON MIGRATION AND SOCIO-ECONOMIC FACTORS**

**NAZİRE BEĞEN**  
**DOCTORAL DISSERTATION**  
**DEPARTMENT OF ECONOMICS**

**GEBZE**  
**2023**

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Thesis Advisor  
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## ÖZET

Uluslararası göçmenler, 2023 yılında dünya nüfusunun %3.6'sını oluşturmıştır. Göç, göçmen gönderen ve alan ülkeler üzerinde sosyal, siyasal ve ekonomik etkilere sahiptir. Bu tez, göçün çeşitli sosyo-ekonomik konular üzerindeki etkilerini inceleyen üç makale sunmaktadır. Bu bağlamda, tez, en fazla göçmen alan ülkelere ABD'de göçmenlerin çalışma saatleri ile ölüm riski arasındaki ilişkiyi ve son yıllarda dünyanın en çok Suriyeliye<sup>1</sup> ev sahipliği yapan Türkiye'de göçmen akımının suç ve işgücü piyasası üzerindeki etkilerini araştırmaktadır. Teze giriş bölümü olan birinci bölümde uluslararası göç hakkında bilgi verilmektedir. İkinci bölüm, ABD'deki yaşlı göçmenler arasında uzun çalışma saatleri (LWH) ile ölüm arasındaki ilişkiyi araştırmaktadır. Analiz sonuçları, haftada 50 saat veya daha fazla çalışma ile tüm nedenlere bağlı ölüm arasında anlamlı bir ilişki olmadığını göstermektedir. Tezin üç

üçüncü ve dördüncü bölümlerinde Türkiye'deki Suriyeli sığınmacıların ülke üzerindeki sosyo-ekonomik etkilerine odaklanılmaktadır. Üçüncü bölüm, kitlesel ve beklenmedik Suriyeli göçmen akımının Türkiye'deki açık iş oranları ve iş bulma oranları üzerindeki etkisini incelemektedir. Sonuçlar, Suriyeli göçmenlerin Türkiye işgücü piyasasında verili işsizlik oranı için doldurulmayan açık pozisyonların ve iş arayanların sayısını azaltarak emek piyasasında eşleşme etkinliğini artırdığını ve işgücü piyasası koşullarını iyileştirdiğini göstermektedir. Farklı meslek grupları için de aynı analizler yapılmıştır. Sonuçlar katsayıların işaretlerinin aynı olduğunu ancak büyüklük ve anlamlılık açısından farklılıklar olduğunu göstermiştir. Dördüncü bölümde, Suriyeli göçmen sayısındaki artışın Türkiye'deki hapsedilme oranları üzerindeki etkisi araştırılmıştır. Sonuçlar, Suriyeli akımının Türkiye'de hapsedilme oranları üzerinde etkisi olmadığını göstermektedir. Son bölüm olan Genel Sonuçlar ve Tartışma bölümü bu üç ampirik çalışmanın sonuçlarını bir çatı altında toplamakta, genel çıkarımlar yapmaktadır.

**Anahtar Kelimeler: Uzun Çalışma Saatleri, Göçmenler, İş Koşulları, Hapishane Oranları, Beveridge Eğrisi.**

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<sup>1</sup> Suriye İç Savaşından kaçıp Türkiye'ye göç eden Suriyeliler uluslararası istatistiklerde mülteci olarak ele alınmaktadır. Türkiye'de yasal olarak geçici koruma statüsündedirler. Bu nedenle tezde Türkiye'de bulunan Suriyeli göçmenler "geçici koruma altındaki Suriyeliler" ya da kısaca "Suriyeliler" olarak adlandırılmaktadır.

## SUMMARY

International migrants accounted for 3.6 percent of the world's population in 2023. Migration has social, political, and economic effects on both sending and receiving countries. This thesis presents three essays on the effects of migration on various socioeconomic outcomes. In this respect, the thesis examines the relationship between the working hours of migrants and the risk of death in the USA, which is one of the countries that receive the most immigrants, and how the migration influx affects crime and the labor market in Türkiye, which is the country that hosts the most Syrians<sup>2</sup> in the world in recent years. The introduction sets the stage by portraying conceptual issues regarding international migration. Following the introduction, the second section investigates the relationship between long working hours (LWH) and mortality among older immigrant populations in the U.S. The results of analyses indicate that there is no significant association between working 50 h/week or more and all-cause mortality. The third and fourth sections of the thesis focus on the socioeconomic effects of Syrians in Türkiye. The third section examines the impact of the massive and unexpected influx of Syrians on the job vacancy rates and job-finding rates in Türkiye. The results indicate that Syrians increase matching efficiency and improve labor market conditions by reducing the number of unfilled vacancies and job seekers for a given unemployment rate in the Turkish labor market. The same analyses were performed across occupations. The results show that the signs of the coefficients are the same but there are differences in magnitude and significance among them. In the fourth section, the impact of an increase in the number of Syrian immigrants on Türkiye's incarceration rate was investigated. The results indicate that the Syrian influx has no impact on the incarceration rate in Türkiye. The last section, General Conclusions and Discussions brings together the results of the three empirical studies and draws general conclusions.

**Key Words: Long Working Hours, Immigrants, Work Conditions, Incarceration Rates, Beveridge Curve.**

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<sup>2</sup> Syrians who fled the Syrian Civil War and migrated to Türkiye are considered as refugees in international statistics. Yet, they are legally under temporary protection status in Türkiye. Therefore, in the thesis, Syrian migrants residing in Türkiye are referred to as "Syrians under temporary protection" or simply "Syrians".

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## LIST OF ABBREVIATIONS

| <b><u>Abbreviation</u></b> | <b><u>Explanation</u></b>                           |
|----------------------------|-----------------------------------------------------|
| AFAD                       | : Afet ve Acil Durum Yönetimi Başkanlığı            |
| BC                         | : Beveridge Curve                                   |
| CI                         | : Confidence Interval                               |
| COEF                       | : Coefficient                                       |
| DiD                        | : Difference-in-Difference                          |
| EUROSTAT                   | Statistical Office of the European Union            |
| FE                         | : Fixed Effects                                     |
| GDP                        | : Gross Domestic Product                            |
| HRR                        | : Hazard Rate Ratio                                 |
| HRs                        | : Hazard Rate Ratios                                |
| HRS                        | : Health and Retirement Survey                      |
| ILO                        | : International Labor Organization                  |
| ISCO                       | : International Standard Classification of Industry |
| ISKUR                      | : Turkish Employment Agency                         |
| IV                         | : Instrumental Variable Approach                    |
| JFR                        | : Job Finding Rates                                 |
| JVR                        | : Job Vacancy Rates                                 |
| LFS                        | : Household Labor Force Survey                      |
| LSS                        | : Life Satisfaction Survey                          |
| LWH                        | : Long Working Hours                                |
| ME                         | : Marginal Effect                                   |
| N                          | : Size of the Population                            |
| N                          | : Sample Size                                       |

| <b><u>Abbreviation</u></b> | <b><u>Explanation</u></b>                                  |
|----------------------------|------------------------------------------------------------|
| NUTS                       | : Nomenclature of Territorial Units for Statistics         |
| IOM                        | : International Organization for Migration                 |
| MPI                        | : Migration Policy Institute                               |
| OECD                       | : Organization for Economic Co-operation and Development   |
| OLS                        | : Ordinary Least Squares                                   |
| RAND                       | : Research and Development.                                |
| RMSPE                      | : Root Mean Square Prediction Error                        |
| SCM                        | : Synthetic Control Method                                 |
| SD                         | : Standard Deviation                                       |
| SE                         | : Standard Error                                           |
| TR                         | : Türkiye                                                  |
| TurkStat                   | : Turkish Statistical Institute                            |
| UN                         | : United Nations                                           |
| UNDESA                     | : United Nations Department of Economic and Social Affairs |
| UNHCR                      | : United Nations Refugee Agency                            |
| US                         | : United States                                            |
| WHO                        | : World Health Organization                                |
| WLS                        | : Weighted Least Squares                                   |

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# 1 INTRODUCTION

Migration has been a significant global phenomenon for centuries, but the 21st century has witnessed an unprecedented increase in its scale and complexity (United Nations, 2020). According to the United Nations (UN), there were 281 million international migrants in 2020, representing 3.6% of the world's population (IOM, 2022). There are multiple reasons why people migrate, and these can be broadly categorized into push and pull factors. Push factors refer to the conditions that make people leave their homes, while pull factors are those that attract them to new destinations (UN, 2018). One of the primary push factors is economic insecurity. Many people migrate in search of better economic opportunities, such as higher wages, better working conditions, or access to social welfare programs. For example, a study by the International Labour Organization (ILO) found that low-income countries experienced higher rates of emigration due to poverty, unemployment, and underemployment (Rakotonarivo, 2021). Political instability and conflict are also significant push factors. People fleeing persecution, war, or political oppression may seek asylum in other countries. According to the World Bank Development Report, there were 184 million forcibly displaced people worldwide at the end of 2023, including 37 million refugees (World Bank Development Report, 2023). Pull factors include a wide range of factors such as higher living standards, better healthcare, education, and political freedom. Developed countries are often destinations for migrants because they offer better job prospects and higher salaries. In the US, for example, migrants from Mexico, Central America, and the Caribbean account for a large portion of the labor force in the agriculture, construction, and hospitality sectors (Passel and Cohn, 2018).

Different sources use different definitions of migrants because the definition of a migrant varies depending on the context and the purpose of the definition. Some sources define migrants broadly to include anyone who has moved from one place to another for some time, while others define migrants more narrowly to include only those who have moved across international borders. Additionally, different institutions use different criteria for categorizing migrants based on factors such as their legal status, the reasons for their migration, and the duration of their stay in the host country. For example, the United Nations defines a migrant as "any person who is moving or has moved across an international border or within a state away from his/her habitual

place of residence, regardless of (1) the person's legal status; (2) whether the movement is voluntary or involuntary; (3) what the causes for the movement are; or (4) what the length of the stay is" (UN, 2018). On the other hand, the International Organization for Migration (IOM) defines a migrant as "any person who is moving or has moved across an international border or within a state away from his/her habitual place of residence, irrespective of (1) the person's legal status; (2) whether the movement is voluntary or involuntary; (3) whether the movement is for a short or a long period; and (4) whether the person moves for reasons of personal or economic reasons, or for reasons of natural disaster, armed conflict or persecution" (Vitorino, 2019). As such, it is important to consider the context and the source of the definition when using terms like migrants, refugees, and asylum seekers.

Here are some definitions of commonly used terms related to migration, refugees, asylum seekers, and immigrants from various institutions and organizations:

Immigrant: "An individual who has moved to a new country and is intending to settle there, typically for permanent residence" (IOM, 2021a).

Refugee: "A person who, owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group, or political opinion, is outside the country of their nationality, and is unable to or, owing to such fear, is unwilling to avail themselves of the protection of that country" (UNHCR, 1951). In Türkiye, on March 17, 2016, the Regulation on the Implementation of the Law on Foreigners, and International Protection (YUKK) was published in the Official Gazette under number 29656. The temporary protection framework of YUKK was also outlined extensively in the Temporary Protection Regulation under decision number 6883 dated 2014. Among foreigners under protection in Türkiye, Syrian nationals are under temporary protection within the scope of international protection. Temporary protection is defined as the provision of protection to foreigners who have been forced to leave their country, cannot return to their country of origin, and have come to or crossed Türkiye's borders in a mass influx seeking urgent and temporary protection.<sup>3</sup>

Asylum seeker: "A person who is seeking international protection and whose claim for refugee status has not yet been determined" (UNHCR, 2019c).

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<sup>3</sup> Therefore, in the thesis, the term "Syrians" is used to refer to those fled to Türkiye to take refugee.

Migrant: "A person who moves away from their place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons" (IOM, 2021a).

Forced migrant: "An individual who has been compelled to leave his or her home, either as a result of persecution, armed conflict, or other forms of violence and human rights violations, and who has not crossed an internationally recognized state border" (IOM, 2019).

Economic migrant: "A person who leaves his or her country of origin in search of better economic opportunities and a higher standard of living" (IOM, 2021a).

Undocumented immigrant: "An individual who does not have the legal right to reside or work in a particular country" (Migration Policy Institute (MPI), 2021).

Internally displaced person: "A person or group of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border" (UNHCR, 1998).

Each of the terminologies mentioned above is known to have different literature. However, in this thesis, the focus is on the literature that follows the terminology of migrants and refugees. According to the literature, migrants and refugees have significant economic, social, and political consequences for both sending and receiving countries. The effects can be both positive and negative, and they vary depending on the context and the types of migration involved. Economically, migration can contribute to economic growth and development (e.g., Doran et al., 2014; Beerli et al., 2021; Basso and Peri, 2020; Hu et al., 2022). Migrants often bring new skills, knowledge, and entrepreneurial energy to their host countries, leading to increased productivity and innovation (e.g., Burchardi et al., 2020; Bahar et al., 2020; Cohen-Goldner and Paserman, 2011; Edwards and Ortega, 2017). However, the negative effects can include downward pressure on wages and working conditions, and the displacement of local workers (e.g., ILO, 2019a; Clemens and Hunt, 2019; Mayda et al., 2017; Joxhe et al., 2017; Albert and Monras, 2022). Socially, migration can result in the formation of diverse and vibrant communities that enrich cultural exchange and understanding (e.g., Stillman et al., 2009; Algan et al., 2010; Moraga, 2011; Mayda et al., 2022; Saiz, 2007). However, it can also lead to social tensions, discrimination, and exclusion, particularly if migrants are perceived as a threat to

national identity or social cohesion (e.g., De Haas et al., 2019; Mayda, 2022; Bertazzini, 2022; Shehaj et al., 2021).

Having considered some of the consequences of immigration mentioned above, immigration has become a prominent topic of discussion in both developed and developing countries as international migration continues to rise. As countries receive immigrants for different reasons, there may be heterogeneity in the effects of immigration on host countries, particularly socioeconomic outcomes. In this regard, this thesis presents three essays that investigate the relationship between migration and socioeconomic outcomes, focusing on the United States and Türkiye, which are among the largest host of immigrants and refugees globally in the last two decades.

It is well known that population aging, caused by an increase in life expectancy and a decrease in fertility rates, has created changes and challenges in various spheres, including the labor market. Though health deteriorates with age, more and more older adults choose to stay in the labor force and work into later life. Understanding the effects of various work conditions on the health of older workers is crucial for designing policies and interventions to ensure healthy late life and maintain a productive workforce. To contribute to this endeavor, the *first essay* investigates the relationship between long working hours (LWH) and mortality among older populations. The essay uses the Cox proportional hazards regression model to investigate data from the Health and Retirement Survey (HRS) which follows individuals biennially from 1992-2016, a longitudinal nationally representative dataset from the United States. The results of Cox Regression Analysis considering workers in the labor force indicate that there is no significant association between working 50 h/week or more and all-cause mortality, referencing respondents working less than 50 h/week for older workers both full sample (1.45 (95% CI: 0.86, 2.45)) and subsamples (female 0.51 (95% CI: 0.06, 4.28), men 1.45 (95% CI: 0.81, 2.61)) in the US. Furthermore, findings show that when compared with other older adult immigrants of the same sex, all-cause mortality HRs 50 h/week or more was estimated at 0.55 (95% CI: 0.06, 4.75) among the female immigrants and 1.44 (95% CI: 0.79, 2.62) among the male immigrants. A probit regressions approach was performed as a robustness check and the coefficient of long working hours (50+) is found in line with the results of the survival analysis. This analysis confirms and extends the findings of earlier studies by

taking into consideration the potential impact of many demographic, socioeconomic, work-related, and health-related factors.<sup>4</sup>

Refugees as well as immigrants have a profound impact on population dynamics, ranging from fertility to population size, from education level to family formation. It is also associated with many social, political, and economic challenges for both origin and destination communities. Taking its size of 3.6 million into account, the recent Syrian influx to Türkiye is expected to affect population dynamics in the country and bring many challenges. This, in turn, from time to time, spurs negative feelings toward the migrant communities. Many times, they are accused of stealing the jobs of the natives or being involved in crimes. In this regard, the *second essay* examines the impact of the massive and unexpected influx of Syrians on the job vacancy rates (JVR) and job-finding rates (JFR) in Türkiye. The difference-in-difference (DiD) estimation method and further, a Synthetic Control Method (SCM) were employed. The results suggest that, compared to the control areas, the JVR and JFR in the treatment area diminished because of the Syrian inflows. While a decline in JVR is often associated with more efficient matching due to a reduced mismatch between labor demand and labor supply, a reduction in JFR indicates that the Beveridge curve shifted inwards, thereby raising matching efficiency and facilitating an improvement in labor market conditions. Moreover, the evidence obtained from SCM is consistent with the baseline analysis results estimated DiD method. Although a considerable amount of literature has been published on the economic impact of immigrants on the labor market outcomes of native workers, there are few studies on how they affect the efficiency of the labor market. Considering the influx of Syrians to Türkiye as a natural experiment in terms of a massive, unexpected labor supply shock, this essay aims at providing considerable benefits from using this context and utilizing the methodology that overcomes the endogeneity problem. Therefore, the Instrumental Variable approach (IV) was utilized to address potential endogeneity issues. While no significant causal impact of the Syrians on JVR was found, JFR decreased between 2009–2018. A reduction in JFR indicates that the Beveridge Curve shifted inwards, thereby raising matching efficiency and facilitating an improvement in labor market conditions.

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<sup>4</sup>This essay, titled "Does an Increase in Working Hours Affect Mortality Risk?: The Relationship Between Working Hours and Mortality Among Older Population" was published on March 25, 2022, in the journal "WORK: A Journal of Prevention, Assessment, and Rehabilitation" which is indexed in the Social Science Citation Index.

Furthermore, the results indicate differences in coefficients and significance in JVR and JFR across occupations, as well as different effects in these areas between the short- and long-term. The results demonstrate that the rapid and unexpected influx of Syrians alleviated JVR and JFR in most of the occupation groups.<sup>5</sup>

In the *third essay*, the impact of an increase in the number of Syrians on a host country's incarceration rate was investigated, through the specific case of the inflow of Syrians into Türkiye. Using statistics from Turkish penal institutions for the period of 2010 to 2015, the difference-in-difference, panel event study, synthetic control, and instrumental variable approaches were employed to measure the changes in the incarceration rate during the time of peak Syrian migration. The results suggest that the Syrian influx into sampled Turkish cities did not have a statistically significant impact on the incarceration rate when compared to control locations. All four of the methods yield similar results in the robustness exercises designed to check the relationship between the number of Syrians and the rate of incarceration. The findings suggest that arguments regarding increased crime rates are unfounded and help clarify the contradictory results in the literature about the effects of immigrants on crime rates thanks to the econometric advantages of the natural experiment.<sup>6</sup>

Overall, these essays contribute to the growing body of literature on the effects of immigration on host countries, particularly about socioeconomic outcomes. As the number of international migrants continues to rise, it is important to understand the potential impact of immigration on host countries and to develop policies and interventions that maximize the benefits of immigration while minimizing any negative consequences.

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<sup>5</sup> This essay, titled "Immigration, job vacancies, and Beveridge Curve: Evidence from Syrian refugees in Türkiye" was published on April 17, 2023, in the journal "The Economic and Labour Relations Review" which is indexed in the Social Science Citation Index.

<sup>6</sup> This essay, titled "Is there a link between immigration and incarceration rate?: Evidence from the Syrian refugee influx to Türkiye" was published on May 24, 2022, in the journal "Global Crime" which is indexed in the Emerging Sources Citation Index.

## **2 DOES AN INCREASE IN WORKING HOURS AFFECT MORTALITY RISK?: THE RELATIONSHIP BETWEEN WORKING HOURS AND MORTALITY AMONG THE OLDER POPULATION**

### **2.1 Introduction**

Population aging, caused by an increase in life expectancy and a decrease in fertility rates, is creating many changes and challenges in social, economic, and political life. From the perspective of the labor market, this phenomenon changes the level and composition of the labor force. It is also associated with transformations in pension systems, wage structures, employment, and productivity (Ferting et al., 2003; Rada, 2013), among others. Beyond these economic consequences, an increase in the number of older workers and participation of “more experienced adults” in the labor force has repercussions for health systems and outcomes. Indeed, research shows that work conditions have various impacts on the health of older workers (Jones et al., 2013; Henseke, 2018), who already face age-related physical and cognitive deterioration (McMahan and Sturz, 2006). Hence, identifying the relationships between various work conditions and health outcomes among older workers is central for policy design to ensure healthy late life and a productive workforce. Accordingly, this essay strives to contribute to this end by investigating the relationship between long working hours (LWH) and mortality among older workers.

In fact, LWH is a much-debated labor concern with a clear scientific basis and applicable policy considerations (Dembe, 2016; Genin, 2016). Working time was one of the earliest labor issues regulated at national and international levels, as its adverse health and familial effects were recognized in the 1800s (ILO, 2019b). Though many OECD countries’ percentage of the population working 40 hours or more per week declined steadily between 1995 and 2017 (OECD, 2018a), long working hours remain an issue for some countries. For instance, in 2017, more than 20% of the workforce in Japan, the Republic of Korea, Mexico, and Türkiye averaged at least 50 hours of weekly working time (ILO, 2020). In the same year, 16.3% of workers worked 50 hours and more per week in the United States (U.S. Bureau of Labor Statistics, 2020).

Accordingly, a large portion of the workforce in many countries potentially faces adverse health outcomes from LWH. Indeed, LWH is associated with many chronic diseases, physical conditions, and psychological disorders, including cardiovascular diseases (Kivimäki et al., 2015a), musculoskeletal disorders (Lee et al., 2018; Barlin et al., 2020), diabetes (Kivimäki et al., 2015b), hypertension (Guner, 2019), metabolic syndrome (Kobayashi et al., 2017), depression (Virtanen et al., 2018), stress (Lee et al., 2017), sleep disruption (Virtanen et al., 2009), and suicidal ideation (Kim et al., 2012). LWH is correlated with scores of other adverse outcomes, including fatigue (Nagashima et al., 2007; Castro et al., 2015), poor self-assessed health (Ettner et al., 2001), all-cause mortality (Nylen et al., 2001; O'Reilly et al., 2013), obesity (Lallukka et al., 2008, Artazcoz et al., 2009), and work-related injuries (Wong et al., 2019; Wang and Delp, 2014), among many others. Moreover, people working long work hours are more likely to consume alcohol and/or smoke (Lallukka et al., 2008, Artazcoz et al., 2009).

Taking into account the various health outcomes of long working hours, some of which could prove fatal in old age (WHO, 2016), and the steadily increasing number of older people in the workforce, it is important to identify if a relationship exists between LWH and mortality among older adults, to evade premature deaths through focused interventions. Accordingly, the present essay draws on responses to the United States Health and Retirement Survey, a nationally representative longitudinal data set, to investigate this relationship using Cox regression survival analyses. This essay also considers gender and immigration background, self-assessed health, and the number of diseases, as well as overnight hospital stay. No previous essay has investigated the relationship between LWH and mortality for older age working adults. The present essay is a first in this respect. Following a literature review on LWH, mortality risk, and immigrants' health, this essay introduces the data and methodology, presents and discusses the results, and finally concludes with implications for future research and policy.

## **2.2 Literature Review**

### **2.2.1 Long Working Hours (LWH) and Mortality Risk**

The various health outcomes associated with long working hours have been investigated greatly (Barnay, 2016; Harrington, 2001; Seth and Singh, 2016; Van, 2003; Kivimäki et al., 2015a; Virtanen et al., 2018). While only a couple of studies

focus on all-cause mortality, their findings are inconsistent and contradictory due to different sampling characteristics, varying thresholds for long work hours, and unique industry-specific circumstances. For instance, based on their study of full-time office staff aged 39–61 from London’s civil service departments, Virtanen et al., (2010) suggest that employees working 1, 2, and 3–4 hours overtime per day have no significant elevated risk for all-cause mortality compared to those who do not work overtime. On the other hand, Nylen, Voss, and Floderus (2001) combined data from the Swedish twin registry with self-reported overtime figures and found gendered differences in mortality risk. Their results demonstrated that for women, up to five hours of overtime did not affect the risk of death, while over five hours increased the risk of death. However, men demonstrated a reduced risk of mortality for a maximum of five hours of overtime per week and no effect on mortality for working over five hours of overtime. This result is in line with empirical evidence provided by Holtermann et al. (2010), whose study of employed men aged 40–59 in Denmark demonstrated that working 41 to 45 hours per week or more was not a significantly increased risk factor for all-cause mortality among men. Furthermore, in a well-known study carried out in Northern Ireland using a data set of full-time employees aged 20–64, O’Reilly and Rosato (2013) indicated no evidence of an increased mortality risk associated with long working hours (more than 55 hours per week). In a recent study, Hannerz and Soll-Johanning (2018) followed a cohort of full-time employees aged 20–64 in Denmark and showed that, while working 41–48 hours per week was statistically significantly associated with decreased all-cause mortality rates, there was no significant effect of overtime work (48 hours or more per week).

Two recent studies have linked long working hours and mortality in the United States. In a meta-analysis, Goh et al. (2015) put forth that, as workplace stressors, long work hours and overtime work increase mortality by 20%. Furthermore, Goh, Pfeffer, and Zenios (2016) established a model linking long work hours to increased mortality and incremental healthcare costs. However, neither of these studies were empirical in nature.

Filling a critical gap in the literature, the present essay extends the investigation of the relationship between long work hours and mortality in older adults, specifically those 50 and older. Moreover, it tests the existence of this relationship based on nationally representative data for the United States.

### **2.2.2 Immigrants' Health and Mortality in the United States**

The United States experienced rapid growth in its foreign-born population throughout the 21st century. More than 44.7 million immigrants lived in the United States in 2018, representing 13.7 percent of the country's population. Both immigrants and US-born older adults represent 16% of their respective populations (MPI, 2018). The immigrant population has a significant influence on American society demographically, economically, fiscally, and politically (Treas J, Batalova, 2009; LaPierre and Hughes 2009). Prior studies have concluded that adult and older immigrants in the United States enjoy better health and lower mortality than the ones born in the United States (Cho and Hummer, 2001; Markides and Eschbach, 2011; Singh and Siahpush, 2002; Abraído-Lanza et al., 2006; Antecol and Bedard, 2006; Uretsky and Mathiesen, 2007). The proposed explanation for these health advantages depends on two hypotheses. The first, referred to as the "healthy-migrant effect" proposes that immigrants are healthier before migration than people born in their host country, as well as people in their home country who do not migrate (Hummer et al., 1999; Singh GK, Siahpush, 2001; Dupre and Vaupel, 2012). The second, the "salmon-bias effect," asserts that immigrants might return to their homeland when they get ill or old to die in their country of origin (Arenas et al., 2015; Markides, 2005; Palloni and Arias, 2004; Turra, 2008). On the other hand, research indicates that this advantage could decrease and converge with native-born levels over time due to limited socioeconomic opportunities (Treas and Batalova, 2009; Myers et al., 2009; Choi, 2009), adoption of unhealthy lifestyles (Cho and Hummer, 2001; Antecol and Bedard, 2006; Morales et al., 2002; Ribble, 2001; Abraido-Lanza et al., 2005), exposure to stress (Finch BK, Vega, 2003; Parent-Lamarche and Marchand, 2018), discrimination (Carrasquillo et al., 2000; Leclerc, 1994), and adverse occupational conditions, including extended work hours (Hunter, 2000; Loh and Richardson, 2004; Conway et al., 2016). Given that a large body of this literature focuses on explaining the factors that affect immigrants' health and mortality, the present essay also investigates the effect of working 50 hours per week or more on older immigrants' all-cause mortality.

## 2.3 Methodology

### 2.3.1 Data and Variables

This essay relies on the Health and Retirement Survey (HRS), which is conducted by the University of Michigan. HRS is a longitudinal panel study that surveys a representative sample of older Americans. Beginning in 1992, HRS has followed 26,000 individuals on a biennial basis and collected information on respondents' socioeconomic characteristics, health status, and work histories. The most recent available survey data was collected in 2016. The RAND user-friendly HRS version was used for the present analysis.

In this essay, the dependent variable in the survival analysis is the risk of a subject dying in a given year, and it is analyzed regardless of the specific cause of death. The respondents' death information is from HRS RAND. The primary independent variable was working 50 hours per week or more.<sup>7</sup> The control variables included demographic factors (e.g., age, level of education, gender, race), socioeconomic factors (e.g., total household real income, marital status), health-related factors (e.g., obesity, smoking, alcohol use, self-reported health), and work-related factors (e.g., tenure, number of jobs, stress) across five industries.<sup>8</sup> Table 2.1 provides detailed information on the creation of these variables. Definitions are written from the RAND HRS Longitudinal File 2016 (V1) Documentation. As members of the armed forces were not included in the analysis, the sample involves only the civilian workforce.<sup>9</sup>

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<sup>7</sup> In previous studies, very long hours, or extreme work hours, or extreme work are used as synonyms and are conceptualized as individuals' weekly work hours of 50 or more (Burger, 2020).

<sup>8</sup> 13 industries were re-categorized into 5 industrial dummy variables.

<sup>9</sup> When military officers are included, the results do not change.

Table 2.1: Definition of Variables Using Study.

| Demographic Factors        |             |                                                                                                                                                                         |
|----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Age                        |             | Age of the respondent                                                                                                                                                   |
| White                      |             | Race of the respondent (Baseline= White, Reference= Black/African American and Other)                                                                                   |
| Education variables        | level dummy | The years of education variable is assigned by looking at reports all waves of data (years of school completed; 0-11,12,13-15,16+)                                      |
| Socioeconomic Factors      |             |                                                                                                                                                                         |
| Household income           | total real  | Total income respondent and spouse (deflated with CPI index and got logarithm)                                                                                          |
| Married                    |             | Marital status reported for each wave (Baseline= married, Reference=married, spouse absent, partnered, separated, divorced, separated/divorced, widowed, never married) |
| Number of cohabitants      |             | Number of people living in the household, including the respondent and spouse                                                                                           |
| Number of children         |             | The number of living children of the respondent and spouse or partner                                                                                                   |
| Health-Related Factors     |             |                                                                                                                                                                         |
| Mortality Risk             |             | If the person dies during the sample years, it will equal to one.                                                                                                       |
| Based_self-reported health |             | Respondent's self-reported general health status based on interviewed year (excellent, very good, good, fair, poor)                                                     |
| Obesity                    |             | Body Mass Index $\geq 30$                                                                                                                                               |
| Based_body mass index      |             | Respondent's body mass index, height, and weight. BMI is weight divided by the square height (in the first year of the interview)                                       |
| Hospitalization            |             | It indicates whether the respondent reports any overnight hospital stay in the Reference period (Baseline= yes, reence=no)                                              |
| Self-reported health       |             | The Respondent's self-reported general health status in the interviewed year (1 means excellent and 5 means poor)                                                       |

Table 2.1: Definition of Variables Using Study (Continued).

|                          |                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of diseases       | The number of diseases the respondent reports ever having                                                                                                                                                                                                                                                                        |
| Health limits work       | It indicates whether an impairment or health problem limits the kind or amount of paid work for the respondent (Baseline=yes, Reference=no)                                                                                                                                                                                      |
| Change in health status  | Respondent's self-reported change in health since the last interview or in the last two years (Baseline=Somewhat worse, Much worse, Reference=Much better, somewhat better, Same)                                                                                                                                                |
| Alcohol consumption      | It indicates whether the Respondent ever drinks alcoholic beverages.                                                                                                                                                                                                                                                             |
| Cigarette consumption    | It indicates whether the respondent smokes cigarettes now                                                                                                                                                                                                                                                                        |
| Work-Related Factors     |                                                                                                                                                                                                                                                                                                                                  |
| Long working hours (50+) | It would equal 1 if the individual worked 50 h/week or more and 0 in other cases. Working hours per week include both main and second jobs.                                                                                                                                                                                      |
| Physical effort          | Respondent says her/his job requires lots of physical effort (Baseline= all/almost all the time, most of the time, Reference= some of the time, none/almost none of the time, does not apply)                                                                                                                                    |
| Stress                   | Respondent agrees with the statement that her/his job involves lots of stress (Baseline=strongly agree, agree, Reference= strongly disagree, does not apply)                                                                                                                                                                     |
| Tenure                   | Respondent's years of tenure on the current job                                                                                                                                                                                                                                                                                  |
| Number of Jobs           | It is the number of jobs the Respondent reports having through job history.                                                                                                                                                                                                                                                      |
| Industry dummy variables | <ol style="list-style-type: none"> <li>1. Agric/Forest/Fish, Mining and Constr</li> <li>2. Mnfg: Non-durable, Mnfg: Durable, Transportation</li> <li>3. Wholesale, Retail, Finan/Ins/RealEs</li> <li>4. Burns/Repair Svc, Personal Service, Entertain/Recreation, Prof/Related Svcs</li> <li>5. Public Administration</li> </ol> |

Table 2.2 provides summary statistics for the Health and Retirement Study (HRS) conducted between 1992 and 2016. The table presents the mean and standard deviation of the different variables of the full sample and the immigrants. The variables include long working hours, age, race, income, marital status, number of cohabitants and children, self-reported health status, change in health status, obesity, body mass index (BMI), hospitalization, number of diseases, work limitations due to health, alcohol consumption, and cigarette consumption.

From 1992 to 2016, after excluding observations with missing data, the overall sample includes a total of 17,527 and 13,262 person-years for women and men, respectively.

Long working hours (50+): The variable indicates whether an individual worked for more than 50 hours per week. The mean value for the full sample is 0.06, indicating that only 6% of the overall sample worked for more than 50 hours per week. The mean value for women is 0.03, indicating that a smaller percentage of women worked for more than 50 hours per week compared to men (mean value of 0.10).

Age: The mean age for the full sample is 68.93, with an SD of 10.441. The mean age for women is slightly higher than for men (69.04 vs 68.76).

White: The variable indicates whether an individual is of a White racial group. The mean value for the full sample is 0.80, indicating that the majority of the sample is White. The mean value for men is slightly higher than for women (0.82 vs 0.79).

Income: The variable represents an individual's income level. The mean income for the full sample is 9.66, with an SD of 1.374. The mean income for women is slightly lower than for men (9.52 vs 9.85).

Married: The variable indicates whether an individual is married. The mean value for the full sample is 0.61, indicating that the majority of the sample is married. The mean value for men is higher than for women (0.74 vs 0.51).

A number of cohabitants: The variable represents the number of people an individual lives with. The mean number of cohabitants for the full sample is 2.18, with an SD of 1.169. The mean value for women is slightly lower than for men (2.11 vs 2.28).

Number of children: The variable represents the number of children an individual has. The mean number of children for the full sample is 3.23, with an SD

of 2.177. There is no significant difference between the mean number of children for women and men.

Based\_self-reported health: The variable indicates an individual's self-reported health status based on their assessment. The mean value for the full sample is 1.97, with an SD of 0.954. The mean value for women is slightly higher than for men (1.99 vs 1.93).

Self-reported health: The variable indicates an individual's self-reported health status based on a standardized measure. The mean value for the full sample is 2.92, with an SD of 1.133. There is no significant difference between the mean self-reported health status for women and men.

Change in health status: The variable represents a change in an individual's health status since the last assessment. The mean value for the full sample is 0.27, with an SD of 0.445. There is no significant difference between the mean change in health status for women and men.

Obesity: The variable indicates whether an individual is obese. The mean value for the full sample is 0.28, indicating that 28% of the sample is obese. There is no significant difference between the mean obesity status for women and men.

Based\_body mass index: The variable represents an individual's body mass index (BMI) based on their assessment. The mean BMI for the full sample is 24.60, with an SD of 4.780. The mean BMI for women is slightly lower than for men (24.27 vs 25.06).

Hospitalization: The variable indicates whether an individual has been hospitalized in the past year. The mean values suggest that 28% of the overall sample has been hospitalized, with a slightly higher percentage for men than for women.

Number of diseases: This variable represents the total number of diseases an individual has been diagnosed with. The mean number of diseases for the overall sample is 2.04, with a slightly higher number for women compared to men.

Health limits work: This variable indicates whether an individual's health condition limits their ability to work. The mean value for the overall sample is 0.31, with no significant gender differences.

Alcohol consumption: This variable shows the frequency of alcohol consumption. The mean value for the overall sample is 0.47, indicating that, on average, individuals consume alcohol almost half of the days in a week. Men consume more alcohol than women, as reflected in gender-specific means.

Cigarette consumption: This variable measures the frequency of cigarette consumption. The mean value for the overall sample is 0.14, indicating that, on average, individuals consume cigarettes less than once a day. There are no significant gender differences.

Stress: This variable measures the frequency of experiencing stress. The mean value for the overall sample is 0.16, indicating that, on average, individuals experience stress less than once a day. Men report slightly higher levels of stress compared to women.

Physical effort: This variable measures the frequency of engaging in physically demanding activities. The mean value for the overall sample is 0.10, indicating that, on average, individuals engage in physically demanding activities less than once a day. Men report higher levels of physical effort compared to women.

Tenure: This variable represents the number of years an individual has worked for their current employer. The mean tenure for the overall sample is 4.04 years, with men having significantly higher tenure than women.

Number of Jobs: This variable represents the total number of jobs an individual has had in their lifetime. The mean number of jobs for the overall sample is 2.06, with men having more jobs than women.

Overall, the descriptive statistics reveal that the sample is predominantly White, married, and has a mean age of 68.93 years. The majority of the sample has cohabitants and children, and their self-reported health status is relatively high. However, the sample also indicates a relatively high prevalence of obesity, hospitalization, and health conditions that limit work. The sample also reports moderate levels of alcohol consumption, low levels of cigarette consumption, stress, and physical effort. These results provide a comprehensive overview of the characteristics of the sample, which can be useful for developing further research questions and analyses.

The second part of the table shows the descriptive statistics of several explanatory variables for a sample of immigrants, with breakdowns by gender. The variables cover a wide range of dimensions, including demographics, health, lifestyle, and work-related characteristics.

The immigrant sample comprised 15,462 female and 11,784 male person-years, in which almost 33% of female immigrants and 68% of male immigrants worked 50 hours per week or more. 1.35% of the overall sample and 1.39% of the immigrant

sample died during the survey period. According to the Centers for Disease Control and Prevention (CDC), the death rate in the United States is 863.8 deaths per 100,000 population. Higher death rates compared with the overall population are expected in this age cohort.

The first variable presented is long working hours, defined as working 50 hours or more per week. The mean for the full sample is 0.06, suggesting that a small proportion of immigrants work such long hours. However, the proportion is higher for men (0.10) than for women (0.03).

The average age of the immigrants in the sample is 69.01 years, with men being slightly younger (68.79 years) than women (69.17 years). The standard deviation of age is relatively high, indicating a large variation in age across the sample.

The third variable is white, which indicates whether the immigrant is of a White racial group. The mean for the full sample is 0.82, indicating that the majority of immigrants in the sample are White. The proportion is slightly higher for men (0.83) than for women (0.80).

The mean income for the full sample is 9.71, indicating a relatively low-income level for immigrants. The mean income is slightly higher for men (9.91) than for women (9.57).

Married is the fifth variable, indicating whether the immigrant is currently married. The mean for the full sample is 0.60, suggesting that a majority of immigrants are currently married. However, the proportion is lower for women (0.51) than for men (0.74).

The number of cohabitants is the sixth variable, which measures the number of people the immigrant is currently living with. The mean for the full sample is 2.12, indicating that immigrants tend to live with at least one other person on average. The mean number of cohabitants is slightly higher for men (2.22) than for women (2.05).

The number of children is the seventh variable, which measures the number of children the immigrant has. The mean for the full sample is 3.19, indicating that immigrants tend to have a relatively high number of children on average. The mean number of children is similar for men and women.

Based on self-reported health is the eighth variable, which measures the immigrant's overall health status based on a self-report. The scale ranges from 1 (very bad) to 5 (very good). The mean for the full sample is 1.95, indicating that immigrants

perceive their health to be somewhat below average on average. The mean score is similar for men and women.

Self-reported health is the ninth variable, which measures the immigrant's overall health status based on a self-report. The scale ranges from 1 (very bad) to 5 (very good). The mean for the full sample is 2.89, indicating that immigrants rate their health as relatively good on average. The mean score is similar for men and women.

Change in health status is the tenth variable, which measures the change in the immigrant's health status over the past year. The scale ranges from 0 (much worse) to 1 (much better). The mean for the full sample is 0.27, indicating a slight improvement in health status on average over the past year. The mean score is similar for men and women.

Obesity is the eleventh variable, which indicates whether the immigrant is obese, defined as having a body mass index (BMI) of 30 or higher. The mean for the full sample is 0.28, suggesting that a relatively small proportion of immigrants are obese. The proportion is slightly higher for women (0.29) than for men (0.26).

The twelfth variable is based on the body mass index (BMI) of immigrants. The mean BMI for the full sample is 24.64, which is considered a healthy weight according to the World Health Organization (WHO). Women have a slightly lower mean BMI (24.29) than men (25.11), indicating that men tend to have a higher body weight on average than women.

The thirteenth variable is hospitalization, which indicates whether the immigrant has been hospitalized in the past year. The mean for the full sample is 0.28, indicating that a relatively small proportion of immigrants have been hospitalized. The proportion is similar for women (0.28) and men (0.29).

The fourteenth variable is the number of diseases that the immigrant has, including both physical and mental illnesses. The mean for the full sample is 2.07, suggesting that immigrants have an average of two diseases. There is no significant difference between women (mean of 2.09) and men (mean of 2.03) in terms of the number of diseases they have.

The fifteenth variable is health limits work, which indicates whether the immigrant's health limits their ability to work. The mean for the full sample is 0.31, indicating that a relatively small proportion of immigrants are limited in their ability to work due to health reasons. Women have a slightly higher mean (0.32) than men (0.31).

The sixteenth variable is alcohol consumption, which indicates whether the immigrant consumes alcohol. The mean for the full sample is 0.47, indicating that slightly less than half of immigrants consume alcohol. Men have a higher mean (0.56) than women (0.42), suggesting that men are more likely to consume alcohol than women.

The seventeenth variable is cigarette consumption, which indicates whether the immigrant smokes cigarettes. The mean for the full sample is 0.14, indicating that a relatively small proportion of immigrants smoke cigarettes. There is no significant difference between women (mean of 0.14) and men (mean of 0.16) in terms of their cigarette consumption.

The eighteenth variable is stress, which indicates whether the immigrant experiences stress. The mean for the full sample is 0.16, indicating that a relatively small proportion of immigrants experience stress. Women have a slightly lower mean (0.14) than men (0.17).

The nineteenth variable is physical effort, which indicates whether the immigrant performs physical work that requires effort. The mean for the full sample is 0.10, indicating that a relatively small proportion of immigrants perform physical work. Women have a lower mean (0.08) than men (0.12), suggesting that men are more likely to perform physically demanding work than women.

The twentieth variable is tenure, which indicates the number of years that the immigrant has been in their current job. The mean for the full sample is 4.13, indicating that immigrants have been in their current job for an average of four years. Women have a lower mean (3.27) than men (5.35), suggesting that men tend to stay in their jobs longer than women.

The final variable is the number of jobs that the immigrant has had, including both past and current jobs. The mean for the full sample is 2.09, indicating that immigrants have had an average of two jobs. Women have had fewer jobs on average (1.89) than men (2.38), suggesting that men are more likely to change jobs than women.

In summary, this table presents 20 variables related to the health, work, and lifestyle of immigrants, including differences between women and men. The results suggest that immigrants tend to be relatively healthy, with a low prevalence of chronic conditions such as obesity and smoking, although there are some gender differences

in these health indicators. Immigrants also tend to work long hours, with around 6% of the full sample working 50 or more hours per week.

In terms of demographic characteristics, the majority of immigrants in this sample are white and married, with an average age of 69 years. Immigrants also have a relatively large number of cohabitants and children compared to the general population. Additionally, the sample has a relatively high level of education, with an average income of 9.71 on a scale of 1-10.

The health indicators in this table suggest that immigrants, in general, have relatively good self-reported health, with an average score of 2.89 on a scale of 1-5, and low levels of stress and physical effort. However, there is some evidence of poor health outcomes, such as the relatively high prevalence of hospitalization and health limits work. The mean number of diseases reported by immigrants is 2.07, indicating that many immigrants have some degree of health issues.

There are also some notable gender differences in the health indicators in this table. For example, women have slightly higher levels of stress and alcohol consumption than men. They are also less likely to work long hours, and they report slightly lower self-reported health scores. However, women have a lower prevalence of smoking and tend to be slightly less obese than men.

Overall, these results suggest that immigrants in this sample are relatively healthy and have a strong work ethic, although there are some gender differences in health indicators. These findings may be useful for policymakers and health practitioners who are interested in understanding the health and work characteristics of immigrant populations.

Table 2.2: Summary Statistics, Health and Retirement Study (1992-2016).

| Explanatory Variables at Baseline | Overall Sample |        |         |        |        |        | Immigrants  |        |        |        |        |        |
|-----------------------------------|----------------|--------|---------|--------|--------|--------|-------------|--------|--------|--------|--------|--------|
|                                   | Full Sample    |        | Women   |        | Men    |        | Full Sample |        | Women  |        | Men    |        |
|                                   | Mean           | SD     | Mean    | SD     | Mean   | SD     | Mean        | SD     | Mean   | SD     | Mean   | SD     |
| Long working hours (50+)          | 0.06           | 0.239  | 0.03    | 0.181  | 0.10   | 0.298  | 0.06        | 0.240  | 0.03   | 0.182  | 0.10   | 0.299  |
| Age                               | 68.93          | 10.441 | 69.04   | 10.884 | 68.76  | 9.780  | 69.01       | 10.429 | 69.17  | 10.882 | 68.79  | 9.752  |
| White                             | 0.80           | 0.398  | 0.79    | 0.407  | 0.82   | 0.385  | 0.82        | 0.388  | 0.80   | 0.398  | 0.83   | 0.372  |
| Income                            | 9.66           | 1.374  | 9.52    | 1.392  | 9.85   | 1.323  | 9.71        | 1.277  | 9.57   | 1.286  | 9.91   | 1.238  |
| Married                           | 0.61           | 0.489  | 0.51    | 0.500  | 0.74   | 0.437  | 0.60        | 0.489  | 0.51   | 0.500  | 0.74   | 0.438  |
| Number of cohabitants             | 2.18           | 1.169  | 2.11    | 1.196  | 2.28   | 1.123  | 2.12        | 1.084  | 2.05   | 1.117  | 2.22   | 1.027  |
| Number of children                | 3.23           | 2.177  | 3.21    | 2.177  | 3.26   | 2.178  | 3.19        | 2.146  | 3.18   | 2.151  | 3.21   | 2.140  |
| Based_self-reported health        | 1.97           | 0.954  | 1.99    | 0.957  | 1.93   | 0.947  | 1.95        | 0.939  | 1.97   | 0.939  | 1.92   | 0.939  |
| Self-reported health              | 2.92           | 1.133  | 2.93    | 1.134  | 2.90   | 1.132  | 2.89        | 1.128  | 2.90   | 1.127  | 2.88   | 1.131  |
| Change in health status           | 0.27           | 0.445  | 0.28    | 0.450  | 0.26   | 0.438  | 0.27        | 0.444  | 0.28   | 0.448  | 0.26   | 0.437  |
| Obesity                           | 0.28           | 0.447  | 0.29    | 0.452  | 0.26   | 0.438  | 0.28        | 0.448  | 0.29   | 0.453  | 0.26   | 0.440  |
| Based_body mass index             | 24.60          | 4.780  | 24.27   | 5.139  | 25.06  | 4.180  | 24.64       | 4.809  | 24.29  | 5.170  | 25.11  | 4.204  |
| Hospitalization                   | 0.28           | 0.449  | 0.27    | 0.446  | 0.29   | 0.452  | 0.28        | 0.451  | 0.28   | 0.448  | 0.29   | 0.454  |
| Number of diseases                | 2.04           | 1.480  | 2.07    | 1.479  | 1.99   | 1.482  | 2.07        | 1.482  | 2.09   | 1.481  | 2.03   | 1.482  |
| Health limits work                | 0.31           | 0.462  | 0.31    | 0.464  | 0.30   | 0.459  | 0.31        | 0.464  | 0.32   | 0.465  | 0.31   | 0.461  |
| Alcohol consumption               | 0.47           | 0.499  | 0.41    | 0.492  | 0.56   | 0.496  | 0.47        | 0.499  | 0.42   | 0.493  | 0.56   | 0.497  |
| Cigarette consumption             | 0.14           | 0.347  | 0.13    | 0.337  | 0.15   | 0.360  | 0.14        | 0.351  | 0.14   | 0.343  | 0.16   | 0.362  |
| Stress                            | 0.16           | 0.362  | 0.14    | 0.348  | 0.18   | 0.380  | 0.16        | 0.362  | 0.14   | 0.349  | 0.17   | 0.379  |
| Physical effort                   | 0.10           | 0.298  | 0.08    | 0.278  | 0.12   | 0.323  | 0.10        | 0.297  | 0.08   | 0.277  | 0.12   | 0.321  |
| Tenure                            | 4.04           | 9.143  | 3.18    | 7.720  | 5.25   | 10.722 | 4.13        | 9.318  | 3.27   | 7.867  | 5.35   | 10.921 |
| Number of Jobs                    | 2.06           | 1.466  | 1.85    | 1.395  | 2.36   | 1.512  | 2.09        | 1.469  | 1.89   | 1.400  | 2.38   | 1.513  |
| N                                 | 174,235        |        | 101,988 |        | 72,247 |        | 155,849     |        | 90,974 |        | 64,875 |        |
| n                                 | 30,789         |        | 17,527  |        | 13,262 |        | 27,246      |        | 15,462 |        | 11,784 |        |

## **2.3.2 Estimation Strategies**

### **2.3.2.1 Cox Regression Hazard Analysis**

The Cox Regression Hazard Analysis, also known as the Cox proportional hazards model, is a statistical method used to analyze survival data. It was first introduced by Sir David Cox in 1972 and has since become one of the most widely used techniques for analyzing time-to-event data (Cox, 1972). This method is particularly useful for analyzing medical data, such as the time until a patient dies, but can be applied to a variety of fields (Kleinbaum, 2012).

The basic idea behind the Cox Regression Hazard Analysis is to model the hazard function, which is the probability that an event will occur in a small time interval given that the event has not occurred up to that point (Kleinbaum, 2012). In other words, it is the instantaneous risk of experiencing an event at a given point in time. The hazard function can be affected by a variety of factors, such as age, gender, and medical conditions.

The Cox Regression Hazard Analysis is a type of survival analysis that allows for the estimation of the hazard function while taking into account the effects of multiple covariates (Kleinbaum, 2012). This method assumes that the hazard ratio, which is the ratio of the hazard function for two different groups, is constant over time. This is known as the proportional hazards assumption (Cox, 1972). If this assumption holds, then the Cox Regression Hazard Analysis can be used to estimate the effect of each covariate on the hazard function while controlling for the effects of other covariates.

To perform the Cox Regression Hazard Analysis, the researcher must first collect survival data, which includes the time until an event occurs and whether or not the event occurred during the study period. The researcher must also collect information on one or more covariates that may affect the hazard function (Kleinbaum, 2012). These covariates may be continuous, such as age or blood pressure, or categorical, such as gender or treatment group.

The Cox Regression Hazard Analysis can be performed using statistical software packages such as SAS, Stata, or R. The output of the analysis typically includes an estimate of the hazard ratio and its confidence interval for each covariate, as well as other measures of model fit and goodness of fit (Kleinbaum, 2012). These results can

be used to identify significant predictors of the event of interest and to estimate the risk associated with each covariate.

In conclusion, the Cox Regression Hazard Analysis is a widely used method for analyzing survival data that allows for the estimation of the hazard function while taking into account the effects of multiple covariates (Kleinbaum, 2012). It is particularly useful in medical research but can be applied to a variety of fields. By understanding the basics of this method, researchers can better analyze time-to-event data and make informed conclusions.

As this statistical method is based on survival analysis, this type of analysis is useful for explaining factors that contribute to mortality risk. According to the essay, the Cox proportional hazards regression model states that the hazard rate for the  $j^{\text{th}}$  subject in the data is:

$$h(t|x_{1j}, x_{2j}, \dots, x_{kj}) = h_0(t) \exp(\beta_1 x_{1j} + \beta_2 x_{2j} + \dots + \beta_k x_{kj}) \quad (1)$$

The Cox model is advantageous because it does not make potentially untenable distributional assumptions about the hazard rate. A positive Cox regression coefficient shows a higher hazard probability for an independent variable. The dependent variable of the essay in such a survival analysis is the risk of an increase in all-cause mortality in a given year. The primary independent variable is binary, with “1” indicating that the participants work more than 49 hours per week.<sup>10</sup>

### 2.3.2.2 Probit Regression Analysis

Probit Regression Analysis is a statistical technique used to model the relationship between a binary response variable and a set of predictor variables (Agresti, 2015). It is a type of regression analysis that uses a probit link function to model the probability of the binary response variable (Hosmer et al., 2013).

Probit Regression Analysis is similar to probit regression analysis, which is another commonly used method for modeling binary response variables (Hosmer et al., 2013). However, while probit regression models the log odds of the response variable, probit regression models the inverse of the cumulative standard normal distribution function of the response variable (Agresti, 2015).

The probit link function used in probit regression analysis is defined as the inverse of the cumulative standard normal distribution function (Agresti, 2015). This link function maps the linear combination of predictor variables to the probability of

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<sup>10</sup>Working hours per week include both for main and second jobs.

the response variable being 1 (Hosmer et al., 2013). The linear combination of predictor variables is modeled using a linear regression model, with the coefficients of the model being estimated using maximum likelihood estimation (Agresti, 2015).

Probit Regression Analysis is often used in social science research to model the relationship between a binary response variable and a set of predictor variables (Hosmer et al., 2013). For example, it may be used to model the probability of an individual being employed or not, based on factors such as education, age, and gender.

Probit Regression Analysis has several advantages over probit regression analysis (Agresti, 2015). Firstly, it provides more interpretable coefficients, as the coefficients are directly related to the change in the probability of the response variable being one, for a one-unit increase in the predictor variable (Hosmer et al., 2013). Secondly, probit regression analysis assumes a normal distribution for the errors, which may be more appropriate for some datasets (Agresti, 2015).

One limitation of probit regression analysis is that it assumes a linear relationship between the predictor variables and the probability of the response variable being one (Hosmer et al., 2013). If this assumption is not met, then the model may not provide accurate predictions (Agresti, 2015).

Another limitation of probit regression analysis is that it may not be appropriate for datasets with a large number of predictor variables (Hosmer et al., 2013). In such cases, alternative methods such as Lasso regression may be more appropriate (Tibshirani, 1994).

In conclusion, Probit Regression Analysis is a useful statistical technique for modeling the relationship between a binary response variable and a set of predictor variables (Agresti, 2015). It is similar to probit regression analysis but provides more interpretable coefficients and assumes a normal distribution for the errors (Hosmer et al., 2013). However, it does assume a linear relationship between the predictor variables and the probability of the response variable being 1 and may not be appropriate for datasets with a large number of predictor variables (Agresti, 2015; Tibshirani, 1994).

Therefore, to check the robustness of the results, the following regression form was used for the probit:

$$D_M = \alpha + \beta LWH + \gamma C + \varepsilon \quad (2)$$

where  $D_M$  equals 1 if the person died during the sample years. LWH is a binary variable that equals 1 if the person works 50 hours per week or more. C is a matrix that includes the control variables.

## 2.4 Results

### 2.4.1 Cox Regression Analysis Estimates

In this section, estimates of the association of working 50 hours per week or more with all-cause mortality for people aged 50 years and older in the United States are presented. Hazard Rate ratios (HRs) for all-cause mortality were estimated as a function of weekly working hours while controlling for demographic, socioeconomic, health-related, and work-related factors.

The Cox regression provided in Equation 1 was conducted for all participants, including those who were part-time, full-time, retired, and unemployed workers. The findings are reported in Table 2.3. The results indicate that there is no significant association between working 50 hours per week or more and all-cause mortality for older workers in the United States (HR: 1.41, 95% CI: 0.85, 2.34). The effects are insignificant, but the coefficient is positive, which matched the expectations for this model. Regarding the control variables, as reported in Table 2.3, older adults are more vulnerable to mortality; a rise in the age of the respondent is associated with a 7% (95% CI: 1.06, 1.07) higher HR for risk of all-cause mortality. Moreover, most health-related control variables are significant in the full sample model. Especially, deterioration in respondents' self-reported health results is a statistically significant 54% (95% CI: 1.45, 1.63) higher HR for risk of all-cause mortality. A rise in the respondent's number of diseases caused a 17% (95% CI: 1.13, 1.21) higher HR for risk of all-cause mortality. People who reported an overnight hospital stay had a 71% (95% CI: 1.56, 1.86) higher HR for risk of all-cause mortality. Having an impairment or health problem that limited the kind or amount of paid work led to a 25% (95% CI: 1.14, 1.37) higher HR for risk of all-cause mortality. On the other hand, job-related control variables such as working jobs requiring great physical effort all or most of the time were not associated with the risk of all-cause mortality.

As mortality generally varies by sex (Kruger and Nesse, 2007; Rogers et al., 2010), to ascertain sex-specific outcomes for the essay, the association of LWH and all-cause mortality were also re-examined separately for women and men. The findings presented in Table 2.3 indicate that for both women (HR: 0.46, 95% CI: 0.06, 3.65)

and men (HR: 1.39, 95% CI: 0.80, 2.41), there is no significant association between working 50 hours per week or more and all-cause mortality, compared to their counterparts working fewer than 50 hours per week. Most health-related control variables reveal similar results in each of the three models. A deterioration in respondents' self-reported health for women and men is associated with 52% (95% CI: 1.40, 1.65) and 53% (95% CI: 1.41, 1.67) higher HR for risk of all-cause mortality, respectively. Women and men who reported an overnight hospital stay had a 69% (95% CI: 1.50, 1.91) and 66% (95% CI: 1.47, 1.89) higher HR for risk of all-cause mortality. Having an impairment or health problem that limited the kind or amount of paid work was associated with a 42% (95% CI: 1.24, 1.62) higher HR for risk of all-cause mortality for women, while it did not affect men's risk of all-cause mortality. On the other hand, most of the job-related control variables were not associated with higher HR for the risk of all-cause mortality for both men and women.

Table 2.3: The Results of Cox Regression Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Full Sample).

| Explanatory Variables at Baseline                   | Full Sample |         |                 | Women    |         |                 | Men      |        |                 |
|-----------------------------------------------------|-------------|---------|-----------------|----------|---------|-----------------|----------|--------|-----------------|
|                                                     | HRR         | SE      | 95% CI          | HRR      | SE      | 95% CI          | HRR      | SE     | 95% CI          |
| Long working hours (50+)                            | 1.415       | 0.365   | [0.853 - 2.345] | 0.456    | 0.485   | [0.057 - 3.659] | 1.391    | 0.389  | [0.804 - 2.408] |
| Age                                                 | 1.073***    | 0.003   | [1.067 - 1.078] | 1.075*** | 0.004   | [1.067 - 1.083] | 1.066*** | 0.004  | [1.058 - 1.074] |
| White                                               | 1.019       | 0.055   | [0.916 - 1.134] | 1.011    | 0.076   | [0.872 - 1.172] | 1.029    | 0.081  | [0.881 - 1.201] |
| Income                                              | 1.023       | 0.021   | [0.982 - 1.066] | 1.018    | 0.028   | [0.964 - 1.074] | 1.004    | 0.028  | [0.949 - 1.061] |
| Married                                             | 0.966       | 0.048   | [0.877 - 1.064] | 0.895    | 0.069   | [0.770 - 1.041] | 0.799*** | 0.054  | [0.700 - 0.912] |
| Number of cohabitants                               | 1.049***    | 0.018   | [1.015 - 1.085] | 1.064*** | 0.023   | [1.019 - 1.110] | 1.024    | 0.028  | [0.972 - 1.080] |
| Number of children                                  | 0.994       | 0.009   | [0.976 - 1.012] | 0.991    | 0.013   | [0.966 - 1.017] | 0.993    | 0.013  | [0.969 - 1.018] |
| Based_self-reported health                          | 1.095***    | 0.026   | [1.046 - 1.146] | 1.123*** | 0.037   | [1.053 - 1.197] | 1.065*   | 0.035  | [0.998 - 1.136] |
| Self-reported health                                | 1.539***    | 0.047   | [1.449 - 1.634] | 1.517*** | 0.064   | [1.396 - 1.647] | 1.534*** | 0.068  | [1.407 - 1.673] |
| Change in health status perceived by the individual | 1.409***    | 0.068   | [1.282 - 1.547] | 1.395*** | 0.093   | [1.224 - 1.590] | 1.470*** | 0.101  | [1.284 - 1.682] |
| Obesity                                             | 0.533***    | 0.037   | [0.464 - 0.612] | 0.599*** | 0.058   | [0.496 - 0.723] | 0.538*** | 0.055  | [0.441 - 0.656] |
| Based_body mass index                               | 1.018***    | 0.006   | [1.006 - 1.031] | 1.004    | 0.008   | [0.988 - 1.021] | 1.024**  | 0.010  | [1.005 - 1.044] |
| Hospitalization                                     | 1.708***    | 0.076   | [1.566 - 1.864] | 1.694*** | 0.104   | [1.502 - 1.910] | 1.664*** | 0.107  | [1.467 - 1.887] |
| Number of diseases                                  | 1.169***    | 0.018   | [1.134 - 1.205] | 1.197*** | 0.027   | [1.146 - 1.250] | 1.143*** | 0.025  | [1.096 - 1.192] |
| Health limits work                                  | 1.249***    | 0.059   | [1.138 - 1.371] | 1.422*** | 0.095   | [1.248 - 1.622] | 1.081    | 0.073  | [0.947 - 1.234] |
| Alcohol consumption                                 | 0.783***    | 0.039   | [0.711 - 0.863] | 0.722*** | 0.056   | [0.621 - 0.840] | 0.748*** | 0.049  | [0.658 - 0.850] |
| Cigarette consumption                               | 1.432***    | 0.096   | [1.256 - 1.632] | 1.500*** | 0.148   | [1.236 - 1.820] | 1.277*** | 0.117  | [1.068 - 1.527] |
| Stress                                              | 0.686*      | 0.145   | [0.454 - 1.037] | 0.424**  | 0.184   | [0.181 - 0.994] | 0.870    | 0.214  | [0.537 - 1.410] |
| Physical effort                                     | 1.101       | 0.233   | [0.727 - 1.668] | 0.830    | 0.369   | [0.347 - 1.986] | 1.291    | 0.325  | [0.788 - 2.116] |
| Tenure                                              | 1.006       | 0.008   | [0.991 - 1.021] | 1.003    | 0.019   | [0.967 - 1.041] | 1.004    | 0.008  | [0.988 - 1.021] |
| Number of Jobs                                      | 1.036**     | 0.017   | [1.004 - 1.070] | 0.972    | 0.027   | [0.921 - 1.026] | 1.027    | 0.022  | [0.985 - 1.072] |
| Education level dummy variables                     |             | ✓       |                 |          | ✓       |                 |          | ✓      |                 |
| Industry dummy variables                            |             | ✓       |                 |          | ✓       |                 |          | ✓      |                 |
| N                                                   |             | 174,235 |                 |          | 101,988 |                 |          | 72,247 |                 |

Abbreviations: HRR=Hazard Rate Ratio; SE=Standard Error; CI=Confidence Interval.

Note: <sup>a</sup>It equals to 1; the individual worked more than 49 hours a week.

\*p<.10, \*\*p<.05, \*\*\*p<.01.

Moreover, the Cox regression provided in Equation 1 was also estimated for workers in the labor force, and the findings of the impact of LWH on mortality are presented in Table 2.4. The results suggest that there is no significant association between working 50 hours per week or more and all-cause mortality, referencing older working respondents working fewer than 50 hours per week in the United States both in the full sample and subsamples. Compared with other employees of the same sex, all-cause mortality HRs for individuals working 50 hours per week or more was estimated at 0.51 (95% CI: 0.06, 4.28) among women and 1.45 (95% CI: 0.81, 2.61) among men. Regarding the control variables, for instance, while an increment in individuals' body mass index had a 5% (95% CI: 1.00, 1.10) higher HR for the risk of all-cause mortality in the full sample, there was no association across the subgroups. People who reported overnight hospital stays had 73% (95% CI: 1.11, 1.70) higher HR for the risk of all-cause mortality, with no difference between women and men employees. Furthermore, a deterioration in working individuals' self-reported health was statistically associated with a 38% (95% CI: 1.01, 1.87) increase in all-cause mortality for the whole sample, as well as a 36% (95% CI: 0.95, 1.94) higher risk for all-cause mortality among men, but no significant enhanced risk for women (HR 1.27, 95% CI: 0.75, 2.18). Moreover, a rise in the respondent's number of diseases was statistically significantly associated with increased all-cause mortality rates among the full sample (HR 1.35, 95% CI: 1.13, 1.60), men workers (HR 1.34, 95% CI: 1.09, 1.65), as well as for women workers (HR 1.42, 95% CI: 1.02, 1.9).

Table 2.4: The Results of Cox Regression Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Workers in Laborforce).

| Explanatory Variables at Baseline                   | Full Sample |        |                 | Women    |        |                 | Men      |        |                 |
|-----------------------------------------------------|-------------|--------|-----------------|----------|--------|-----------------|----------|--------|-----------------|
|                                                     | HRR         | SE     | 95% CI          | HRR      | SE     | 95% CI          | HRR      | SE     | 95% CI          |
| Long working hours (50+)                            | 1.451       | 0.389  | [0.858 - 2.454] | 0.511    | 0.555  | [0.061 - 4.283] | 1.450    | 0.435  | [0.805 - 2.611] |
| Age                                                 | 1.078***    | 0.016  | [1.046 - 1.110] | 1.047    | 0.031  | [0.989 - 1.110] | 1.078*** | 0.020  | [1.039 - 1.118] |
| White                                               | 0.991       | 0.269  | [0.583 - 1.687] | 0.395**  | 0.175  | [0.166 - 0.939] | 1.619    | 0.604  | [0.780 - 3.362] |
| Income                                              | 1.056       | 0.080  | [0.910 - 1.226] | 0.854**  | 0.061  | [0.743 - 0.982] | 1.133    | 0.109  | [0.939 - 1.367] |
| Married                                             | 0.889       | 0.202  | [0.569 - 1.388] | 1.146    | 0.465  | [0.517 - 2.541] | 0.581**  | 0.153  | [0.347 - 0.973] |
| Number of cohabitants                               | 0.930       | 0.084  | [0.779 - 1.111] | 0.898    | 0.162  | [0.631 - 1.279] | 0.952    | 0.096  | [0.782 - 1.160] |
| Number of children                                  | 1.054       | 0.054  | [0.953 - 1.166] | 1.001    | 0.104  | [0.816 - 1.228] | 1.081    | 0.061  | [0.969 - 1.207] |
| Based_self-reported health                          | 0.968       | 0.136  | [0.735 - 1.275] | 0.919    | 0.251  | [0.538 - 1.568] | 0.981    | 0.162  | [0.710 - 1.356] |
| Self-reported health                                | 1.376**     | 0.215  | [1.013 - 1.870] | 1.277    | 0.348  | [0.748 - 2.179] | 1.359*   | 0.247  | [0.952 - 1.939] |
| Change in health status perceived by the individual | 1.315       | 0.310  | [0.828 - 2.088] | 3.908*** | 1.652  | [1.707 - 8.947] | 0.906    | 0.254  | [0.523 - 1.570] |
| Obesity                                             | 0.561**     | 0.152  | [0.330 - 0.956] | 0.636    | 0.314  | [0.242 - 1.674] | 0.629    | 0.198  | [0.339 - 1.167] |
| Based_body mass index                               | 1.050**     | 0.026  | [1.001 - 1.101] | 1.027    | 0.042  | [0.947 - 1.113] | 1.027    | 0.035  | [0.961 - 1.097] |
| Hospitalization                                     | 1.732**     | 0.393  | [1.110 - 2.701] | 2.111    | 1.040  | [0.804 - 5.542] | 1.532    | 0.406  | [0.911 - 2.576] |
| Number of diseases                                  | 1.345***    | 0.121  | [1.128 - 1.603] | 1.416**  | 0.235  | [1.023 - 1.960] | 1.340*** | 0.141  | [1.090 - 1.646] |
| Health limits work                                  | 1.503       | 0.375  | [0.922 - 2.450] | 1.478    | 0.714  | [0.573 - 3.811] | 1.603*   | 0.458  | [0.916 - 2.806] |
| Alcohol consumption                                 | 0.876       | 0.184  | [0.580 - 1.323] | 0.949    | 0.376  | [0.436 - 2.063] | 0.781    | 0.193  | [0.482 - 1.268] |
| Cigarette consumption                               | 1.582*      | 0.430  | [0.929 - 2.697] | 1.598    | 0.899  | [0.531 - 4.815] | 1.458    | 0.465  | [0.781 - 2.722] |
| Stress                                              | 0.735       | 0.164  | [0.474 - 1.138] | 0.421*   | 0.195  | [0.169 - 1.045] | 0.924    | 0.240  | [0.556 - 1.537] |
| Physical effort                                     | 1.251       | 0.292  | [0.791 - 1.977] | 0.874    | 0.431  | [0.332 - 2.298] | 1.536    | 0.430  | [0.887 - 2.659] |
| Tenure                                              | 1.007       | 0.009  | [0.990 - 1.024] | 1.014    | 0.025  | [0.967 - 1.064] | 1.001    | 0.009  | [0.983 - 1.019] |
| Number of Jobs                                      | 1.069       | 0.076  | [0.931 - 1.228] | 1.032    | 0.187  | [0.724 - 1.471] | 1.033    | 0.081  | [0.886 - 1.205] |
| Education level dummy variables                     |             | ✓      |                 |          | ✓      |                 |          | ✓      |                 |
| Industry dummy variables                            |             | ✓      |                 |          | ✓      |                 |          | ✓      |                 |
| N                                                   |             | 53,839 |                 |          | 27,601 |                 |          | 26,238 |                 |

Abbreviations: HRR=Hazard Rate Ratio; SE=Standard Error; CI=Confidence Interval.

Note: <sup>a</sup>It equals to 1; the individual worked more than 49 hours a week.

\*p<.10, \*\*p<.05, \*\*\*p<.01.

Considering immigrants, the general point of view is that foreign-born individuals tend to have a lower risk for mortality when compared to their United States-born counterparts (Mehta et al., 2016; Singh and Siahpush, 2002). If this situation is valid for the essay, it could provide another explanation for the established findings between LWH and mortality, since about 89% of the sample consists of immigrants. To examine this connection, the survival analysis was reconducted with only immigrants' data. Moreover, the analysis was carried out for male and female immigrants separately for two reasons. First, gender is a crucial selection factor in migration (Cerrutti and Massey, 2001), and second, it is an important indicator of the healthy immigrant effect (Kwak, 2018).

The results obtained from the fundamental analysis on the impact of LWH on all-cause mortality are provided in Table 2.5, and findings for immigrant workers in the labor force are presented in Table 2.6. According to both tables, there was no significant association between all-cause mortality and working 50 hours per week or more across all sub-samples. More specifically, in Table 2.5, compared with other older adult immigrants of the same sex, all-cause mortality HRs for individuals working 50 hours per week or more was estimated at 0.49 (95% CI: 0.06, 4.00) among the female immigrants and 1.38 (95% CI: 0.78, 2.43) among the male immigrants. As for the control variables, an increase in older immigrants' age significantly raises the mortality risk by about 7% for women (95% CI: 1.06, 1.08) and 6% for men (95% CI: 1.05, 1.07). Additionally, most of the prominent health-related factors potentially contributed to the higher mortality rates in all sub-samples. For instance, increased mortality risk was observed among those who reported an overnight hospital stay for the full sample at 65% (95% CI: 1.51, 1.81), for women at 61% (95% CI: 1.42, 1.83), and for men at 64% (95% CI: 1.45, 1.88). A rise in an immigrant's number of diseases created a higher mortality risk for the full sample (HRR: 1.15, 95% CI: 1.12, 1.19), for female immigrants (HRR: 1.17 95% CI: 1.12, 1.23), and for male immigrants (HRR: 1.13, 95% CI: 1.09, 1.19). A deterioration in immigrants' self-reported health remains a life-threatening condition with increased mortality rates by about 57% (95% CI: 1.47, 1.67) for the full sample, 55% (95% CI: 1.42, 1.69) for women, and 56% (95% CI: 1.43, 1.71) for men. On the other hand, as Table 2.6 shows, all-cause mortality HRs for individuals working 50 hours per week or more was estimated at 0.55 (95% CI: 0.06, 4.75) among the female immigrants and 1.44 (95% CI: 0.79, 2.62) among the male immigrants in the labor force. An overnight hospital stay contributed to the

significantly higher mortality rates for all immigrants (HRR:1.82, 95% CI: 1.16, 2.84), as well as women (HRR: 2.37, 95% CI: 0.90, 6.26) and men (HRR: 1.59, 95% CI: 0.94, 2.69) separately. An increase in an immigrant's number of diseases significantly raised the mortality risk for the full sample by about 32% (95% CI: 1.10, 1.59), for women by 41% (95% CI: 1.00, 2.00), and for men by 31% (95% CI: 1.05, 1.62). Aging leads to a 7.3% (95% CI: 0.85, 2.50) higher HR for the risk of all-cause mortality for all immigrants and male immigrants. A deterioration of immigrants' self-reported health created a statistically significant mortality risk for all immigrant workers (HRR: 1.42, 95% CI: 1.04, 1.94) and for female immigrants (HRR: 1.33, 95% CI: 0.76, 2.33).



Table 2.5: The Results of Cox Regression Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Immigrant Sample).

| Explanatory Variables at Baseline                   | Full Sample |         |                 | Women    |        |                 | Men      |        |                 |
|-----------------------------------------------------|-------------|---------|-----------------|----------|--------|-----------------|----------|--------|-----------------|
|                                                     | HRR         | SE      | 95% CI          | HRR      | SE     | 95% CI          | HRR      | SE     | 95% CI          |
| Long working hours (50+)                            | 1.426       | 0.377   | [0.849 - 2.393] | 0.495    | 0.527  | [0.061 - 3.992] | 1.380    | 0.398  | [0.784 - 2.427] |
| Age                                                 | 1.071***    | 0.003   | [1.065 - 1.077] | 1.074*** | 0.004  | [1.065 - 1.082] | 1.064*** | 0.004  | [1.056 - 1.072] |
| White                                               | 1.032       | 0.059   | [0.922 - 1.154] | 1.006    | 0.080  | [0.860 - 1.176] | 1.055    | 0.088  | [0.896 - 1.242] |
| Income                                              | 1.010       | 0.022   | [0.968 - 1.055] | 1.003    | 0.029  | [0.948 - 1.061] | 0.991    | 0.029  | [0.934 - 1.050] |
| Married                                             | 0.964       | 0.049   | [0.872 - 1.066] | 0.895    | 0.072  | [0.765 - 1.047] | 0.795*** | 0.055  | [0.693 - 0.910] |
| Number of cohabitants                               | 1.079***    | 0.019   | [1.042 - 1.117] | 1.086*** | 0.025  | [1.038 - 1.136] | 1.067**  | 0.030  | [1.010 - 1.127] |
| Number of children                                  | 1.001       | 0.009   | [0.983 - 1.020] | 1.000    | 0.014  | [0.973 - 1.027] | 1.001    | 0.013  | [0.976 - 1.026] |
| Based_self-reported health                          | 1.090***    | 0.027   | [1.039 - 1.144] | 1.125*** | 0.039  | [1.052 - 1.204] | 1.052    | 0.036  | [0.984 - 1.125] |
| Self-reported health                                | 1.569***    | 0.050   | [1.474 - 1.670] | 1.546*** | 0.068  | [1.417 - 1.686] | 1.561*** | 0.071  | [1.429 - 1.707] |
| Change in health status perceived by the individual | 1.424***    | 0.071   | [1.291 - 1.570] | 1.394*** | 0.097  | [1.215 - 1.598] | 1.503*** | 0.108  | [1.306 - 1.730] |
| Obesity                                             | 0.514***    | 0.038   | [0.445 - 0.595] | 0.585*** | 0.060  | [0.479 - 0.714] | 0.512*** | 0.055  | [0.415 - 0.631] |
| Based_body mass index                               | 1.020***    | 0.006   | [1.007 - 1.032] | 1.006    | 0.009  | [0.989 - 1.023] | 1.025**  | 0.010  | [1.005 - 1.046] |
| Hospitalization                                     | 1.657***    | 0.076   | [1.514 - 1.814] | 1.613*** | 0.103  | [1.424 - 1.828] | 1.649*** | 0.110  | [1.448 - 1.878] |
| Number of diseases                                  | 1.156***    | 0.019   | [1.120 - 1.194] | 1.177*** | 0.027  | [1.125 - 1.232] | 1.137*** | 0.026  | [1.088 - 1.188] |
| Health limits work                                  | 1.238***    | 0.062   | [1.122 - 1.365] | 1.434*** | 0.101  | [1.249 - 1.646] | 1.057    | 0.075  | [0.920 - 1.214] |
| Alcohol consumption                                 | 0.795***    | 0.041   | [0.718 - 0.879] | 0.728*** | 0.059  | [0.621 - 0.854] | 0.763*** | 0.051  | [0.669 - 0.871] |
| Cigarette consumption                               | 1.424***    | 0.098   | [1.244 - 1.630] | 1.506*** | 0.154  | [1.232 - 1.841] | 1.265**  | 0.118  | [1.053 - 1.520] |
| Stress                                              | 0.629**     | 0.137   | [0.411 - 0.963] | 0.376**  | 0.172  | [0.154 - 0.920] | 0.807    | 0.204  | [0.492 - 1.326] |
| Physical effort                                     | 1.217       | 0.261   | [0.799 - 1.853] | 0.918    | 0.406  | [0.385 - 2.185] | 1.438    | 0.369  | [0.870 - 2.378] |
| Tenure                                              | 1.004       | 0.008   | [0.989 - 1.020] | 1.000    | 0.020  | [0.961 - 1.041] | 1.002    | 0.008  | [0.986 - 1.019] |
| Number of Jobs                                      | 1.023       | 0.018   | [0.989 - 1.058] | 0.955    | 0.028  | [0.902 - 1.011] | 1.017    | 0.023  | [0.972 - 1.063] |
| Education level dummy variables                     |             | ✓       |                 |          | ✓      |                 |          | ✓      |                 |
| Industry dummy variables                            |             | ✓       |                 |          | ✓      |                 |          | ✓      |                 |
| N                                                   |             | 155,849 |                 |          | 90,974 |                 |          | 64,875 |                 |

Abbreviations: HRR=Hazard Rate Ratio; SE=Standard Error; CI=Confidence Interval.

Note: <sup>a</sup> It equals to 1; the individual worked more than 49 hours a week.

\*p<.10, \*\*p<.05, \*\*\*p<.01.

Table 2.6: The Results of Cox Regression Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Immigrant Workers in Labor Force).

| Explanatory Variables at Baseline                   | Full Sample |        |                 | Women    |        |                 | Men      |        |                 |
|-----------------------------------------------------|-------------|--------|-----------------|----------|--------|-----------------|----------|--------|-----------------|
|                                                     | HRR         | SE     | 95% CI          | HRR      | SE     | 95% CI          | HRR      | SE     | 95% CI          |
| Long working hours (50+)                            | 1.463       | 0.401  | [0.855 - 2.503] | 0.550    | 0.604  | [0.064 - 4.741] | 1.438    | 0.440  | [0.789 - 2.620] |
| Age                                                 | 1.073***    | 0.017  | [1.041 - 1.106] | 1.042    | 0.031  | [0.983 - 1.104] | 1.074*** | 0.020  | [1.035 - 1.114] |
| White                                               | 0.907       | 0.249  | [0.530 - 1.555] | 0.343**  | 0.157  | [0.140 - 0.842] | 1.476    | 0.553  | [0.708 - 3.075] |
| Income                                              | 1.050       | 0.086  | [0.895 - 1.232] | 0.846**  | 0.068  | [0.722 - 0.991] | 1.123    | 0.115  | [0.918 - 1.372] |
| Married                                             | 0.829       | 0.192  | [0.526 - 1.307] | 1.060    | 0.441  | [0.469 - 2.394] | 0.527**  | 0.141  | [0.313 - 0.889] |
| Number of cohabitants                               | 0.952       | 0.089  | [0.794 - 1.143] | 0.872    | 0.181  | [0.581 - 1.310] | 1.002    | 0.101  | [0.822 - 1.221] |
| Number of children                                  | 1.053       | 0.056  | [0.948 - 1.169] | 0.991    | 0.105  | [0.804 - 1.221] | 1.084    | 0.062  | [0.968 - 1.213] |
| Based_self-reported health                          | 0.982       | 0.141  | [0.741 - 1.301] | 0.901    | 0.266  | [0.505 - 1.609] | 1.022    | 0.167  | [0.741 - 1.408] |
| Self-reported health                                | 1.422**     | 0.227  | [1.041 - 1.944] | 1.331    | 0.381  | [0.759 - 2.334] | 1.384*   | 0.255  | [0.965 - 1.986] |
| Change in health status perceived by the individual | 1.231       | 0.300  | [0.764 - 1.984] | 3.710*** | 1.602  | [1.591 - 8.650] | 0.848    | 0.245  | [0.481 - 1.493] |
| Obesity                                             | 0.546**     | 0.152  | [0.316 - 0.943] | 0.560    | 0.289  | [0.204 - 1.542] | 0.631    | 0.203  | [0.336 - 1.186] |
| Based_body mass index                               | 1.050**     | 0.026  | [1.001 - 1.102] | 1.023    | 0.044  | [0.940 - 1.112] | 1.033    | 0.034  | [0.968 - 1.103] |
| Hospitalization                                     | 1.819***    | 0.415  | [1.163 - 2.846] | 2.376*   | 1.174  | [0.902 - 6.259] | 1.592*   | 0.425  | [0.944 - 2.687] |
| Number of diseases                                  | 1.325***    | 0.125  | [1.102 - 1.594] | 1.411*   | 0.249  | [0.999 - 1.994] | 1.309**  | 0.144  | [1.055 - 1.624] |
| Health limits work                                  | 1.398       | 0.362  | [0.841 - 2.323] | 1.287    | 0.681  | [0.456 - 3.632] | 1.545    | 0.450  | [0.873 - 2.733] |
| Alcohol consumption                                 | 0.940       | 0.202  | [0.617 - 1.432] | 0.970    | 0.399  | [0.433 - 2.174] | 0.845    | 0.212  | [0.516 - 1.382] |
| Cigarette consumption                               | 1.549       | 0.428  | [0.902 - 2.661] | 1.530    | 0.908  | [0.478 - 4.896] | 1.436    | 0.462  | [0.764 - 2.698] |
| Stress                                              | 0.664*      | 0.152  | [0.424 - 1.040] | 0.363**  | 0.174  | [0.142 - 0.928] | 0.843    | 0.223  | [0.502 - 1.415] |
| Physical effort                                     | 1.352       | 0.318  | [0.852 - 2.144] | 1.030    | 0.495  | [0.402 - 2.644] | 1.643*   | 0.472  | [0.936 - 2.884] |
| Tenure                                              | 1.006       | 0.009  | [0.988 - 1.024] | 1.009    | 0.026  | [0.960 - 1.062] | 1.002    | 0.009  | [0.984 - 1.020] |
| Number of Jobs                                      | 1.064       | 0.079  | [0.920 - 1.231] | 0.997    | 0.195  | [0.680 - 1.462] | 1.040    | 0.084  | [0.888 - 1.220] |
| Education level dummy variables                     |             | ✓      |                 |          | ✓      |                 |          | ✓      |                 |
| Industry dummy variables                            |             | ✓      |                 |          | ✓      |                 |          | ✓      |                 |
| N                                                   |             | 48,227 |                 |          | 24,826 |                 |          | 23,401 |                 |

Abbreviations: HRR=Hazard Rate Ratio; SE=Standard Error; CI=Confidence Interval.

Note: <sup>a</sup> It equals to 1; the individual worked more than 49 hours a week.

\*p<.10, \*\*p<.05, \*\*\*p< .01.

## 2.5 Robustness Check

### 2.5.1 Probit Regression Analysis Estimates

Although results estimated through the Cox regression analysis strongly suggest that working longer hours is not associated with all-cause mortality, a probit regression model was performed using the panel data as a robustness check for all the aforementioned models.

The probit method assumes that the error terms follow a normal distribution, and the normality tests provide evidence that this assumption holds. According to the findings of normality tests such as the Jarque-Bera test, which indicate the normality of the error terms, the probit method was chosen as a robustness measure. By choosing the probit method, it can be ensured that the estimation results are robust and reliable, as they are based on the assumption of normally distributed error terms.

As shown in Table 2.7 and Table 2.8, the coefficient of long working hours (50+) estimated from the probit models aligns with the results of the survival analysis, indicating that we would fail to reject the null hypothesis and conclude that the regression coefficient for working 50 hours per week, or more is not statistically different from zero in all models. Moreover, the sign of the coefficients matched the findings reported in Tables 2.3 and 2.4. In Table 2.7, the coefficient of the 50-hour dummy is 0.164 (Marginal effect (ME): 0.0042, Standard Error (SE): 0.0031) for the full sample, -0.313 (ME: -0.0071, SE: 0.0097) for women, and 0.164 (ME: 0.0048, SE: 0.0038) for men. In Table 2.8, the coefficient of the 50-hour dummy is 0.105 (ME: 0.00039, SE: 0.00049) for the full sample, -0.611 (ME: -0.0010, SE: 0.0011) for women, and 0.107 (ME: 0.00057, SE: 0.00083) for men. In both tables, although not significant, this means that people who work 50 hours per week or more are more likely to face an increased risk of death when considering the full sample and the male subsample, while the opposite is true for women.

As concerns the control variables, the estimated regression coefficients of most of the health and job-related factors presented in Table 2.7 are significant and reveal similar results in each of the three models, whereas some of the established coefficients regarding health and job-related factors presented in Table 2.8, such as hospitalization and a number of diseases, are significant and vary across subgroups.

Table 2.7: The Results of Probit Model Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Full Sample).

| Explanatory Variables at Baseline                   | Full Sample |         |         | Women     |         |         | Men       |        |         |
|-----------------------------------------------------|-------------|---------|---------|-----------|---------|---------|-----------|--------|---------|
|                                                     | COEF.       | SE      | ME      | COEF.     | SE      | ME      | COEF.     | SE     | ME      |
| Long working hours (50+)                            | 0.164       | 0.121   | 0.0042  | -0.313    | 0.426   | -0.0071 | 0.164     | 0.131  | 0.0049  |
| Age                                                 | 0.050***    | 0.002   | 0.0013  | 0.051***  | 0.004   | 0.0012  | 0.047***  | 0.003  | 0.0014  |
| White                                               | 0.034       | 0.035   | 0.0009  | 0.026     | 0.051   | 0.0006  | 0.047     | 0.050  | 0.0014  |
| Income                                              | 0.026**     | 0.012   | 0.0007  | 0.021     | 0.015   | 0.0005  | 0.018     | 0.016  | 0.0005  |
| Married                                             | -0.016      | 0.029   | -0.0004 | -0.072    | 0.045   | -0.0017 | -0.148*** | 0.042  | -0.0044 |
| Number of cohabitants                               | 0.032***    | 0.011   | 0.0008  | 0.039***  | 0.015   | 0.0009  | 0.024     | 0.016  | 0.0007  |
| Number of children                                  | -0.012**    | 0.006   | -0.0003 | -0.014    | 0.009   | -0.0003 | -0.011    | 0.008  | -0.0003 |
| Based_self-reported health                          | 0.211***    | 0.017   | 0.0054  | 0.221***  | 0.024   | 0.0050  | 0.195***  | 0.023  | 0.0058  |
| Self-reported health                                | 0.207***    | 0.018   | 0.0054  | 0.209***  | 0.025   | 0.0048  | 0.197***  | 0.025  | 0.0059  |
| Change in health status perceived by the individual | 0.225***    | 0.026   | 0.0059  | 0.216***  | 0.036   | 0.0049  | 0.257***  | 0.037  | 0.0077  |
| Obesity                                             | -0.433***   | 0.041   | -0.0113 | -0.362*** | 0.057   | -0.0083 | -0.417*** | 0.059  | -0.0124 |
| Based_body mass index                               | 0.013***    | 0.004   | 0.0003  | 0.005     | 0.005   | 0.0001  | 0.014**   | 0.006  | 0.0004  |
| Hospitalization                                     | 0.300***    | 0.024   | 0.0078  | 0.300***  | 0.033   | 0.0068  | 0.285***  | 0.034  | 0.0085  |
| Number of diseases                                  | 0.087***    | 0.011   | 0.0023  | 0.107***  | 0.016   | 0.0024  | 0.073***  | 0.015  | 0.0022  |
| Health limits work                                  | -0.003      | 0.025   | -0.0001 | 0.046     | 0.036   | 0.0010  | -0.066*   | 0.036  | -0.0020 |
| Alcohol consumption                                 | -0.177***   | 0.029   | -0.0046 | -0.229*** | 0.044   | -0.0052 | -0.210*** | 0.038  | -0.0063 |
| Cigarette consumption                               | 0.197***    | 0.040   | 0.0051  | 0.193***  | 0.061   | 0.0044  | 0.146***  | 0.054  | 0.0043  |
| Stress                                              | -0.174*     | 0.093   | -0.0045 | -0.317*   | 0.176   | -0.0072 | -0.096    | 0.111  | -0.0029 |
| Physical effort                                     | 0.009       | 0.096   | 0.0002  | -0.202    | 0.194   | -0.0046 | 0.106     | 0.113  | 0.0032  |
| Tenure                                              | -0.003      | 0.004   | -0.0001 | -0.005    | 0.008   | -0.0001 | -0.004    | 0.004  | -0.0001 |
| Number of Jobs                                      | -0.025**    | 0.010   | -0.0007 | -0.067*** | 0.018   | -0.0015 | -0.038*** | 0.014  | -0.0011 |
| Education level dummy variables                     |             | ✓       |         |           | ✓       |         |           | ✓      |         |
| Industry dummy variables                            |             | ✓       |         |           | ✓       |         |           | ✓      |         |
| N                                                   |             | 203,636 |         |           | 118,093 |         |           | 85,542 |         |

Abbreviations: COEF=Coefficient; SE=Standard Error; ME=Marjinal Effect.

Note: <sup>a</sup>It equals to 1; the individual worked more than 49 hours a week.

\*p<.10, \*\*p<.05, \*\*\*p<.01.

Table 2.8: The Results of Probit Model Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Workers in Laborforce).

| Explanatory Variables at Baseline                   | Full Sample |        |         | Women   |        |          | Men      |        |          |
|-----------------------------------------------------|-------------|--------|---------|---------|--------|----------|----------|--------|----------|
|                                                     | COEF.       | SE     | ME      | COEF.   | SE     | ME       | COEF.    | SE     | ME       |
| Long working hours (50+)                            | 0.105       | 0.131  | 0.0004  | -0.611  | 0.812  | -0.0010  | 0.107    | 0.156  | 0.0006   |
| Age                                                 | 0.040***    | 0.010  | 0.0002  | 0.052   | 0.041  | 0.0001   | 0.042*** | 0.012  | 0.0002   |
| White                                               | 0.035       | 0.131  | 0.0001  | -0.592  | 0.477  | -0.0010  | 0.303    | 0.210  | 0.0016   |
| Income                                              | 0.084*      | 0.048  | 0.0003  | -0.041  | 0.075  | -0.0001  | 0.124**  | 0.060  | 0.0007   |
| Married                                             | -0.054      | 0.112  | -0.0002 | 0.271   | 0.295  | 0.0004   | -0.341** | 0.165  | -0.0018  |
| Number of cohabitants                               | -0.014      | 0.042  | -0.0001 | -0.074  | 0.100  | -0.0001  | 0.003    | 0.053  | 0.00002  |
| Number of children                                  | 0.026       | 0.026  | 0.0001  | -0.035  | 0.061  | -0.0001  | 0.050    | 0.034  | 0.0003   |
| Based_self-reported health                          | 0.086       | 0.076  | 0.0003  | 0.222   | 0.257  | 0.0004   | 0.063    | 0.095  | 0.0003   |
| Self-reported health                                | 0.155*      | 0.081  | 0.0006  | 0.217   | 0.175  | 0.0004   | 0.159    | 0.103  | 0.0009   |
| Change in health status perceived by the individual | 0.123       | 0.111  | 0.0005  | 0.764*  | 0.397  | 0.0013   | -0.087   | 0.155  | -0.0005  |
| Obesity                                             | -0.363**    | 0.149  | -0.0014 | -0.432  | 0.370  | -0.0007  | -0.320*  | 0.184  | -0.0017  |
| Based_body mass index                               | 0.023*      | 0.012  | 0.0001  | 0.018   | 0.028  | 0.00003  | 0.017    | 0.018  | 0.0001   |
| Hospitalization                                     | 0.323***    | 0.105  | 0.0012  | 0.381   | 0.251  | 0.0006   | 0.315**  | 0.132  | 0.0017   |
| Number of diseases                                  | 0.144***    | 0.055  | 0.0005  | 0.201   | 0.165  | 0.0003   | 0.175**  | 0.072  | 0.0009   |
| Health limits work                                  | 0.198       | 0.122  | 0.0007  | 0.211   | 0.331  | 0.0003   | 0.247    | 0.154  | 0.0013   |
| Alcohol consumption                                 | -0.119      | 0.100  | -0.0005 | -0.172  | 0.236  | -0.0003  | -0.158   | 0.129  | -0.0008  |
| Cigarette consumption                               | 0.183       | 0.128  | 0.0007  | 0.347   | 0.324  | 0.0006   | 0.106    | 0.174  | 0.0006   |
| Stress                                              | -0.189*     | 0.109  | -0.0007 | -0.503* | 0.274  | -0.0008  | -0.082   | 0.136  | -0.0004  |
| Physical effort                                     | 0.057       | 0.110  | 0.0002  | -0.309  | 0.371  | -0.0005  | 0.191    | 0.140  | 0.0010   |
| Tenure                                              | -0.000      | 0.005  | 0.0000  | 0.003   | 0.014  | 0.000004 | -0.002   | 0.005  | -0.00001 |
| Number of Jobs                                      | 0.023       | 0.035  | 0.0001  | 0.021   | 0.104  | 0.00004  | 0.014    | 0.044  | 0.0001   |
| Education level dummy variables                     |             | ✓      |         |         | ✓      |          |          | ✓      |          |
| Industry dummy variables                            |             | ✓      |         |         | ✓      |          |          | ✓      |          |
| N                                                   |             | 66,684 |         |         | 33,525 |          |          | 33,159 |          |

Abbreviations: COEF=Coefficient; SE=Standard Error; ME=Marjinal Effect.

Note: <sup>a</sup>It equals to 1; the individual worked more than 49 hours a week.

\*p<.10, \*\*p<.05, \*\*\*p< .01.

As can be seen in Table 2.9, the coefficient of the 50-hour dummy was 0.160 (ME: 0.0043, SE: 0.0033) for all immigrants in the sample, -0.282 (ME: -0.0066, SE: 0.0099) for female immigrants, and 0.154 (ME: 0.0047, SE: 0.0041) for male immigrants. Regarding the health-related factors, an increase in the number of diseases, a deterioration in self-reported health, and having an impairment or health problem were associated with a higher mortality risk across all sub-samples. Additionally, some of the demographic factors, such as number of children and increased age, also led to an increase in immigrants' mortality risk.

Probit regression analyses were also conducted for immigrant employees in the labor force who worked 50 hours per week or more, and the results are presented in Table 2.10. Although not significant, the coefficient of the 50-hour dummy is 0.112 (ME: 0.00044, SE: 0.00054) for the full sample, -0.607 (ME: -0.0011, SE: 0.0014) for female immigrants, and 0.117 (ME: 0.00066, SE: 0.00092) for male immigrants. For the entire immigrant sample and the male immigrant subsample, overnight hospital stays, an increase in the number of diseases, a decrease in self-reported health, and advanced age all contributed to the risk of mortality.

In conclusion, the estimation results from the probit models for the immigrant population affirm those in the essay's base specification reported in Table 2.9 and Table 2.10. The analysis failed to find any statistically significant evidence of an association between working 50 hours per week or more and all-cause mortality, and the signs of the probit model estimates coincide with the results estimated from the Cox model across all specifications.

Table 2.9: The Results of Probit Model Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Immigrant Sample).

| Explanatory Variables at Baseline                   | Full Sample |         |         | Women     |         |         | Men       |        |         |
|-----------------------------------------------------|-------------|---------|---------|-----------|---------|---------|-----------|--------|---------|
|                                                     | COEF        | SE      | ME      | COEF      | SE      | ME      | COEF      | SE     | ME      |
| Long working hours (50+)                            | 0.160       | 0.123   | 0.0043  | -0.282    | 0.421   | -0.0067 | 0.154     | 0.135  | 0.0047  |
| Age                                                 | 0.047***    | 0.002   | 0.0013  | 0.048***  | 0.004   | 0.0011  | 0.044***  | 0.004  | 0.0014  |
| White                                               | 0.033       | 0.037   | 0.0009  | 0.016     | 0.052   | 0.0004  | 0.049     | 0.053  | 0.0015  |
| Income                                              | 0.015       | 0.012   | 0.0004  | 0.009     | 0.016   | 0.0002  | 0.006     | 0.016  | 0.0002  |
| Married                                             | -0.026      | 0.030   | -0.0007 | -0.083*   | 0.047   | -0.0020 | -0.160*** | 0.043  | -0.0049 |
| Number of cohabitants                               | 0.048***    | 0.012   | 0.0013  | 0.051***  | 0.016   | 0.0012  | 0.046***  | 0.017  | 0.0014  |
| Number of children                                  | -0.008      | 0.006   | -0.0002 | -0.008    | 0.009   | -0.0002 | -0.008    | 0.009  | -0.0003 |
| Based_self-reported health                          | 0.201***    | 0.017   | 0.0054  | 0.213***  | 0.025   | 0.0050  | 0.184***  | 0.024  | 0.0057  |
| Self-reported health                                | 0.220***    | 0.018   | 0.0059  | 0.220***  | 0.026   | 0.0052  | 0.212***  | 0.026  | 0.0065  |
| Change in health status perceived by the individual | 0.224***    | 0.027   | 0.0060  | 0.208***  | 0.037   | 0.0049  | 0.264***  | 0.039  | 0.0081  |
| Obesity                                             | -0.447***   | 0.043   | -0.0120 | -0.372*** | 0.060   | -0.0088 | -0.437*** | 0.063  | -0.0134 |
| Based_body mass index                               | 0.014***    | 0.004   | 0.0004  | 0.005     | 0.005   | 0.0001  | 0.016***  | 0.006  | 0.0005  |
| Hospitalization                                     | 0.280***    | 0.024   | 0.0075  | 0.272***  | 0.034   | 0.0064  | 0.275***  | 0.035  | 0.0085  |
| Number of diseases                                  | 0.080***    | 0.011   | 0.0021  | 0.097***  | 0.017   | 0.0023  | 0.069***  | 0.016  | 0.0021  |
| Health limits work                                  | -0.003      | 0.026   | -0.0001 | 0.046     | 0.038   | 0.0011  | -0.066*   | 0.038  | -0.0020 |
| Alcohol consumption                                 | -0.157***   | 0.029   | -0.0042 | -0.213*** | 0.046   | -0.0050 | -0.184*** | 0.039  | -0.0057 |
| Cigarette consumption                               | 0.185***    | 0.041   | 0.0050  | 0.184***  | 0.062   | 0.0043  | 0.134**   | 0.056  | 0.0041  |
| Stress                                              | -0.200**    | 0.096   | -0.0054 | -0.350*   | 0.182   | -0.0083 | -0.120    | 0.114  | -0.0037 |
| Physical effort                                     | 0.047       | 0.097   | 0.0013  | -0.164    | 0.193   | -0.0039 | 0.146     | 0.115  | 0.0045  |
| Tenure                                              | -0.003      | 0.004   | -0.0001 | -0.006    | 0.009   | -0.0001 | -0.004    | 0.004  | -0.0001 |
| Number of Jobs                                      | -0.031***   | 0.011   | -0.0008 | -0.076*** | 0.018   | -0.0018 | -0.041*** | 0.015  | -0.0013 |
| Education level dummy variables                     |             | ✓       |         |           | ✓       |         |           | ✓      |         |
| Industry dummy variables                            |             | ✓       |         |           | ✓       |         |           | ✓      |         |
| N                                                   |             | 180,951 |         |           | 104,633 |         |           | 76,317 |         |

Abbreviations: COEF=Coefficient; SE=Standard Error; ME=Marjinal Effect.

Note: <sup>a</sup> It equals to 1, the individual worked more than 49 hours in a week.

\*p<.10, \*\*p<.05, \*\*\*p< .01.

Table 2.10: The Results of Probit Model Analysis; Effect of Long Working Hours on the Risk of Mortality in the Health and Retirement Study, 1992-2016 (Immigrant Workers in Labor Force).

| Explanatory Variables at Baseline                   | Full Sample |        |           | Women   |        |           | Men      |        |           |
|-----------------------------------------------------|-------------|--------|-----------|---------|--------|-----------|----------|--------|-----------|
|                                                     | COEF        | SE     | ME        | COEF    | SE     | ME        | COEF     | SE     | ME        |
| Long working hours (50+)                            | 0.112       | 0.136  | 0.0004    | -0.607  | 0.885  | -0.0011   | 0.117    | 0.165  | -0.0011   |
| Age                                                 | 0.040***    | 0.010  | 0.0002    | 0.050   | 0.044  | 0.0001    | 0.043*** | 0.013  | 0.0001    |
| White                                               | 0.015       | 0.138  | 0.0001    | -0.675  | 0.526  | -0.0012   | 0.330    | 0.238  | -0.0012   |
| Income                                              | 0.084       | 0.054  | 0.0003    | -0.043  | 0.088  | -0.0001   | 0.124*   | 0.069  | -0.0001   |
| Married                                             | -0.089      | 0.117  | -0.0004   | 0.232   | 0.288  | 0.0004    | -0.405** | 0.182  | 0.0004    |
| Number of cohabitants                               | -0.020      | 0.044  | -0.0001   | -0.080  | 0.107  | -0.0001   | 0.004    | 0.057  | -0.0001   |
| Number of children                                  | 0.027       | 0.028  | 0.0001    | -0.042  | 0.064  | -0.0001   | 0.057    | 0.037  | -0.0001   |
| Based_self-reported health                          | 0.103       | 0.080  | 0.0004    | 0.221   | 0.276  | 0.0004    | 0.090    | 0.099  | 0.0004    |
| Self-reported health                                | 0.188**     | 0.086  | 0.0008    | 0.242   | 0.181  | 0.0004    | 0.194*   | 0.114  | 0.0004    |
| Change in health status perceived by the individual | 0.089       | 0.116  | 0.0004    | 0.724*  | 0.406  | 0.0013    | -0.132   | 0.165  | 0.0013    |
| Obesity                                             | -0.362**    | 0.156  | -0.0015   | -0.512  | 0.399  | -0.0009   | -0.292   | 0.191  | -0.0009   |
| Based_body mass index                               | 0.022*      | 0.012  | 0.0001    | 0.015   | 0.028  | 0.00003   | 0.018    | 0.018  | 0.00003   |
| Hospitalization                                     | 0.324***    | 0.108  | 0.0013    | 0.419*  | 0.253  | 0.0008    | 0.306**  | 0.139  | 0.0008    |
| Number of diseases                                  | 0.138**     | 0.058  | 0.0006    | 0.206   | 0.181  | 0.0004    | 0.166**  | 0.076  | 0.0004    |
| Health limits work                                  | 0.161       | 0.126  | 0.0006    | 0.076   | 0.287  | 0.0001    | 0.241    | 0.162  | 0.0001    |
| Alcohol consumption                                 | -0.093      | 0.104  | -0.0004   | -0.147  | 0.239  | -0.0003   | -0.129   | 0.135  | -0.0003   |
| Cigarette consumption                               | 0.179       | 0.133  | 0.0007    | 0.329   | 0.338  | 0.0006    | 0.105    | 0.184  | 0.0006    |
| Stress                                              | -0.234**    | 0.117  | -0.0009   | -0.562* | 0.297  | -0.0010   | -0.129   | 0.147  | -0.0010   |
| Physical effort                                     | 0.101       | 0.112  | 0.0004    | -0.221  | 0.361  | -0.0004   | 0.241*   | 0.145  | -0.0004   |
| Tenure                                              | -0.001      | 0.005  | -0.000002 | -0.001  | 0.014  | -0.000002 | -0.001   | 0.006  | -0.000002 |
| Number of Jobs                                      | 0.023       | 0.038  | 0.0001    | -0.001  | 0.105  | -0.000001 | 0.020    | 0.048  | -0.000001 |
| Education level dummy variables                     |             | ✓      |           |         | ✓      |           |          | ✓      |           |
| Industry dummy variables                            |             | ✓      |           |         | ✓      |           |          | ✓      |           |
| N                                                   |             | 59,375 |           |         | 29,968 |           |          | 29,407 |           |

Abbreviations: COEF=Coefficient; SE=Standard Error; ME=Marjinal Effect.

Note: <sup>a</sup> It equals to 1, the individual worked more than 49 hours in a week.

\*p<.10, \*\*p<.05, \*\*\*p< .01.

## 2.6 Conclusion and Discussion

This essay used the HRS data set, which follows individuals biennially from 1992 to 2016, and constituted a first attempt to uncover the relationship between LWH and mortality among older adults in the United States. Despite the fatal potential of some health outcomes of LWH, such as stroke (Kivimäki et al. 2015a), cardiovascular disease (Virtanen et al., 2018), and diabetes (Kivimäki et al., 2015b), the findings of this essay show that LWH is not associated with a statistically significantly higher or lower probability of having all-cause mortality for all participants, including part-time, full-time, retired and unemployed workers. The main findings do not change with several control methods, including regarding gender and immigrant background. The estimation results affirm those from the base specification.

The results obtained from the Cox regression and Probit model analyses confirm and extend the findings of earlier studies by taking into consideration the potential impact of many demographic, socioeconomic, work-related, and health-related factors. Any comparison with earlier studies should be made carefully due to different age intervals, definitions of long working hours, and time frames. Nonetheless, findings largely confirm those of Holtermann et al. (2010) and Virtanen et al. (2010), which did not find an increased risk of mortality resulting from working overtime. The results also lend support to the findings of O'Reilly and Rosato (2013) and Hannerz and Soll-Johanning (2018) on the basis of nationally representative longitudinal data. On the other hand, it contradicts the results of Goh, Pfeffer, and Zenios (2016), at least for the older population. Gendered differences were not found as in Nylen, Voss, and Floderus (2013), which evidenced elevated mortality for women working five or more overtime hours per week.

Thanks to the survey structure of HRS, the present essay could focus on older immigrants. The general point of view is that foreign-born individuals tend to have a lower mortality risk than their peers born in the United States (Abraído-Lanza et al., 2006; Cerrutti and Massey, 2001). If this situation was valid for the present essay, it could provide another explanation for the established findings between LWH and mortality. Therefore, the same analyses were conducted for immigrant workers in the labor force. The results were similar to the estimates obtained from the baseline model.

This essay has important strengths. Its main strength is that the entirety of the working older participants was randomly selected from the target inhabitants in the

United States. The second significant advantage is germane to a healthy worker effect, which proposes that individuals who have poor health may cut back on working hours. This may be the cause of the non-significant association. To circumvent this problem, several variables related to personal health (e.g., self-reported general health status, obesity, health problems limiting the kind or amount of paid work, number of diseases, overnight hospital stay, and alcohol and cigarette consumption) were included. Furthermore, in line with the literature (Shah, 2009), because the essay used twelve waves of flow-up data, the healthy worker effect was substantially reduced. The third strength is that contrary to other studies (Goh et al., 2015), this essay drew on information on working hours for both main jobs and subsidiary occupations from 1992 to 2016, which prevented the underestimation of results.

While the essay did not find a relationship between LWH and mortality, the results should be carefully considered, as the sample only included older adults. The need for work time directives to reduce the risk of health problems arising from long work hours should not be dismissed. Moreover, policies and interventions should take into account the essay's auxiliary findings. In this regard, older adults' self-assessed health, number of diseases, and record of overnight hospital stay should be closely monitored by physicians and occupational health service providers so that precautionary measures can be taken.

This essay has some important limitations, mostly owing to the nature of the HRS. For example, all of the essay variables (e.g., height, weight, etc.) were self-reported by survey respondents. Additionally, the survey data also excludes institutionalized adults. Finally, the dataset does not include information on youth, so the analysis could not extend to the younger generations.

Further research should be conducted covering a wider age span and incorporating data from different countries. In addition, studies could be undertaken that consider the association between LWH and mortality for specific sectors and occupations, to assess if there are higher-risk occupations for health hazards related to overtime work.

# **3 IMMIGRATION, JOB VACANCIES, AND THE BEVERIDGE CURVE: EVIDENCE FROM SYRIANS IN TÜRKİYE**

## **3.1 Introduction**

As of mid-2020, the number of people forcibly displaced from their homes due to persecution, conflict, generalized violence, and violations of human rights exceeds 80 million globally, and 26.3 million of those people are categorized as refugees (UNHCR, 2022). Moreover, as national policies on refugees and their residence status vary greatly, these people often face significant barriers to participation in their new local economies and thus are largely employed in the informal sector, leading to lower earnings and employment rates than economic immigrants (see Dustmann et al., 2016). Accordingly, the impact that refugees have on the labor market, particularly in terms of employment, may differ significantly from that of voluntary migrants, since the involuntary influx of Syrians represents a massive, unexpected, and exogenous labor supply shock consisting of largely low-skill workers, the economic response to these refugees can be more negative than to those who migrate voluntarily (Becker and Ferrara, 2019). In this respect, analyzing the impact of refugees on the economy of the host country, especially on the labor market is vital for policy prescriptions and adjusting to the new normal. An exogenous increase in the number of employees alleviates the number of job vacancies or induces an inward shift in the Beveridge Curve (Shimer, 2005). While most previous studies investigated the effect of refugees on natives' employment and unemployment (e.g., Alix-Garcia and Bartlett, 2015; Ruiz and Vargas-Silva, 2016), no studies have examined the way an influx of a massive refugee population impacts the number of job vacancies or Beveridge Curve in the host country. This essay aims to fill this gap by investigating the case of Syrians in Türkiye through the methodology outlined by previous studies (e.g., Tumen, 2021).

Approximately 85% of refugees settle in low- and middle-income countries that face significant economic challenges. Türkiye is hosting the greatest percentage of refugees worldwide. Starting with the onset of the Syrian Civil War in 2011, the number of Syrians in Türkiye rapidly increased and made the country with the largest Syrian migrant population (UNCHR, 2023). The number of Syrians in Türkiye surged from 144,755 in 2012 to 3.65 million in 2021 (see Figure 3.1). They were unevenly

dispersed across areas and occupations. They were concentrated in provinces in the southeast up to mid-2014. Thereafter, they began to move west.<sup>11</sup> The majority of them work in the construction, production, and service sectors. These trends have shaped immigration policy in Türkiye and motivated a large body of research examining the economic impacts of them.

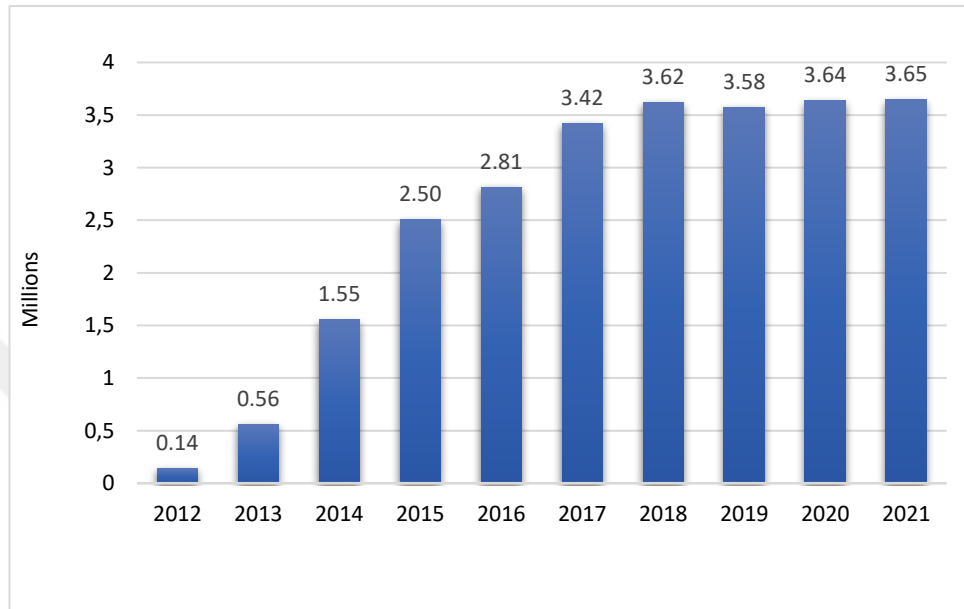


Figure 3.1: Number of Registered Syrians (2012–2021).

In addition to the disproportionate migration of Syrians over the last nine years, Türkiye has also faced a higher unemployment rate and a lower job vacancy rate during this period. Figure 3.2 demonstrates that the unemployment rate in Türkiye decreased between 2009–2012 but dramatically increased afterward. Data is obtained from Turkish Employment Agency (ISKUR) and Turkish Statistical Institute (TurkStat).

<sup>11</sup> Table 3.1 provides details on the Syrians' ratios in the NUTS2 regions in Türkiye as of the end of 2015, while Figure 3.5 illustrates these ratios on a map.

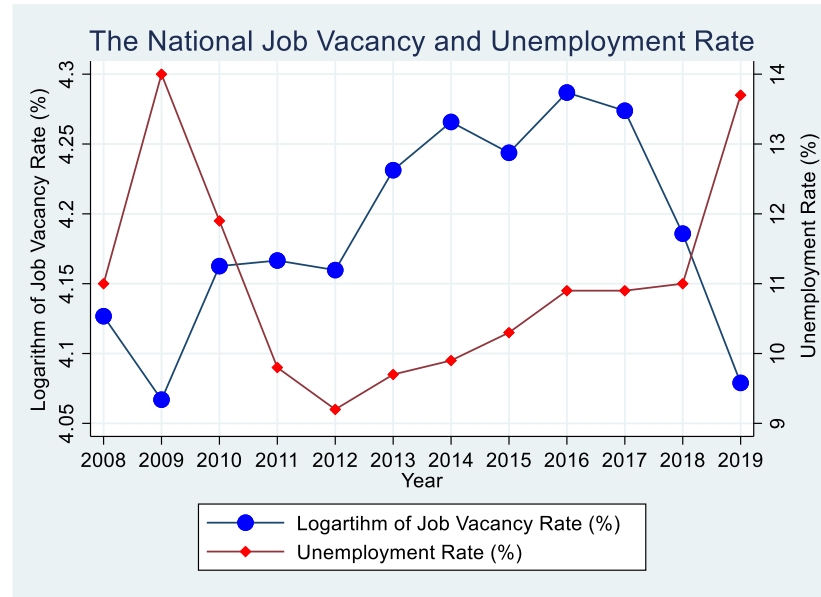


Figure 3.2: The National Job Vacancy Rate and Unemployment Rate (2008–2019).

On the other hand, many researchers have found that Syrians increase native-born workers' unemployment rate (e.g., Ceritoglu et al., 2017; Tumen, 2016). Therefore, the present essay aims to investigate the impact of Syrians on the Beveridge Curve, which depicts a negative relationship between unemployment and job vacancies in an economy. It is expected that an excess supply of labor, a labor market shock, to cause a leftward shift of the Beveridge Curve. This is because Syrians would search for jobs more aggressively and fill up vacancies more quickly, which in turn improves job matching between employees and available job opportunities. Indeed, when Türkiye's Beveridge Curve in Figure 3.3 is examined, such an effect is observed, especially after the arrival of Syrian migrants in the years following 2012. Data is obtained from Turkish Employment Agency (ISKUR) and Turkish Statistical Institute (TurkStat). This raises the question of whether the Beveridge Curve shifted inward after 2012 due to decreased efficiency in the process of matching vacancies and native workers.

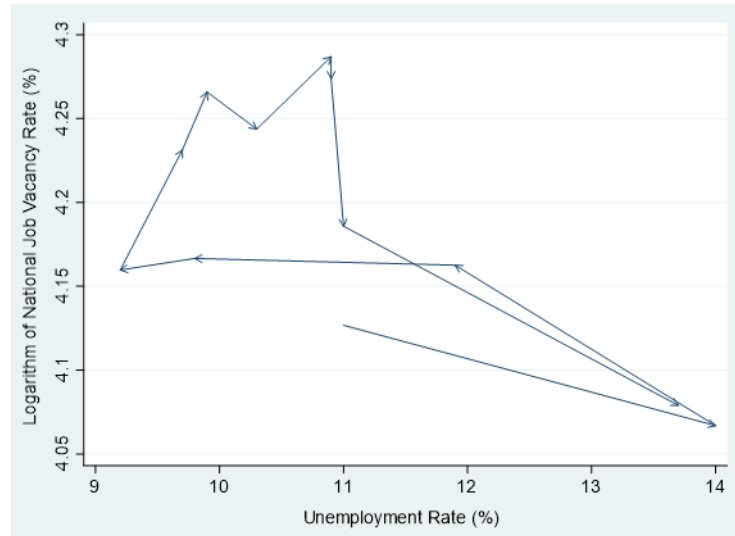


Figure 3.3: The Beveridge Curve of Türkiye (2008–2019).

Studies investigating the impact of refugees on citizens' employment have yielded mixed findings. Refugees may increase competition for low-skill jobs (e.g., Maystadt and Verwimp, 2014) and increase job displacement of natives in occupations such as mining, hotels, restaurants, wholesale trade, and agriculture (e.g., Labanca, 2016; Sarvimäki et al., 2022). On the other hand, a handful of studies suggest that refugees have positive effects on the employment of natives in some sectors, including construction and educational services, which see an increase in demand for certain goods and services thanks to refugees' consumption (e.g., Labanca, 2016). While some studies indicate that refugees improve citizens' employment opportunities (e.g., Braun and Mahmoud, 2014; Ruiz and Vargas-Silva, 2016), others assert that refugees may improve natives' employment in high-skill sectors (e.g., Alix-Garcia and Bartlett, 2015) like government or professional occupations (Ruiz and Vargas-Silva, 2015), manufacturing (Peters, 2017). Finally, a few studies have found no association between refugee inflows and employment (e.g., Labanca, 2016). Evidenced by previous research, as refugees are typically employed in more labor-intensive and low-skill occupations in low-technology sectors, they may also influence the job vacancy rate and Beveridge Curve differently across occupations (Oțoiu, and Țițan, 2020). Therefore, the essay also delves into the change in job vacancy rates and Beveridge Curve in nine occupational groups during the same period. Figure 3.4 also shows a negative reverse correlation between the national job vacancy rate and unemployment rate throughout much of the period.<sup>12</sup> The Beveridge Curve is obtained from the

<sup>12</sup> Data from 2009–2018 was used in the analysis due to the economic crisis in 2008 and the lack of data in 2019 at the NUTS2 region level.

matching function, which depicts the matching of job seekers to job vacancies. If the matching function has a constant return to scale, it becomes a special function called the Job Finding Rate (JFR) (e.g., Anastasopoulos et al., 2021). Thus, the job-finding rate was considered a dependent variable while investigating how Syrians affect the Beveridge Curve.<sup>13</sup>

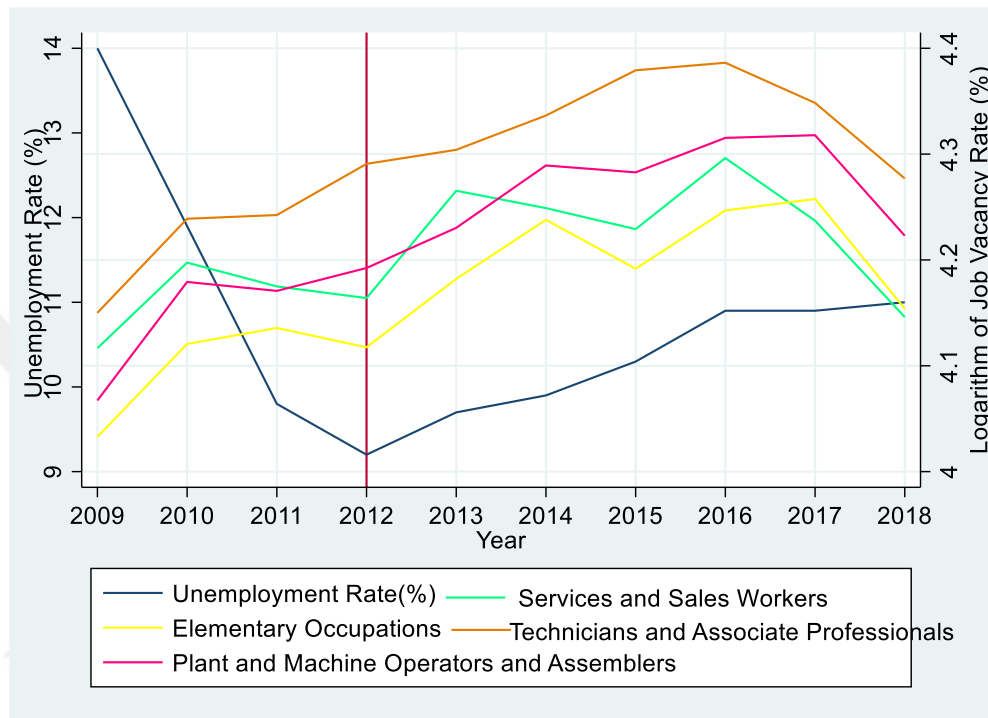


Figure 3.4: The National Job Vacancy Rate and Unemployment Rate by Occupation Groups (2009–2018).

<sup>13</sup> For more detailed theoretical framework see 3.2.1.

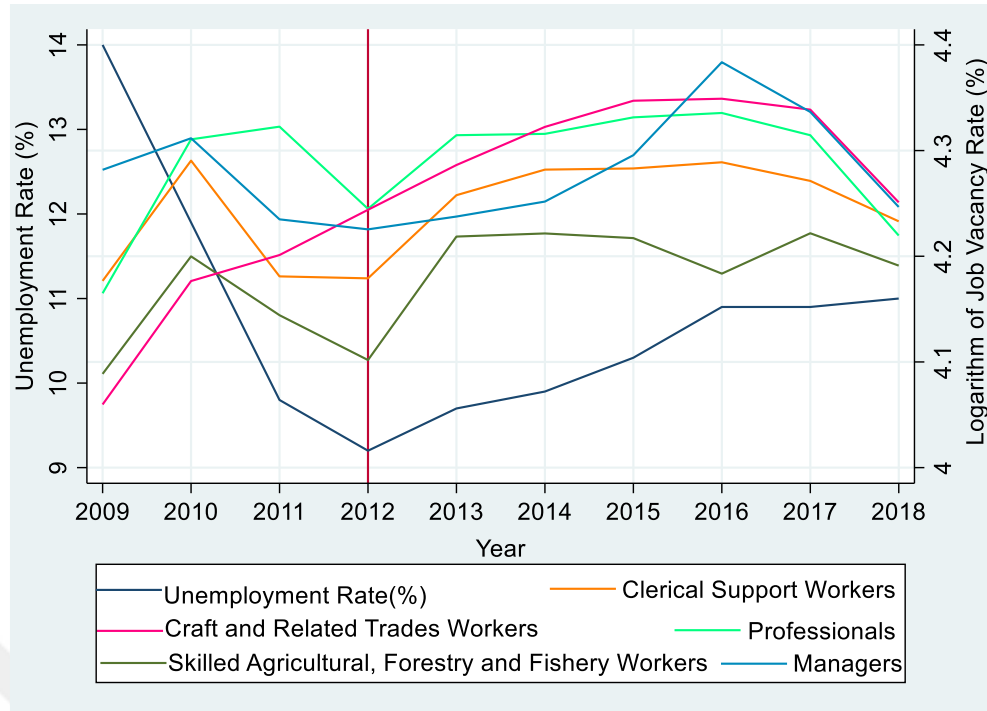


Figure 3.4: The National Job Vacancy Rate and Unemployment Rate by Occupation Groups (2009–2018) (Continued).

The goal of this essay is to estimate the essay's baseline models using a Difference-in-Difference (DiD) approach, which is the most widely used empirical strategy for studies on Türkiye (e.g., Tumen, 2016; Ceritoglu et al., 2017), as well as to perform a robustness assessment for this DiD approach utilizing from the synthetic control method (SCM) (Abadie and Gardeazabal, 2003). The results suggest that the job vacancy rate in the treatment area has diminished compared to the control areas because of the Syrian inflows and that this is often associated with more efficient matching due to a reduced mismatch between labor demand and labor supply. This also implies that they may have reduced firms' costs by eliminating the extra time and effort spent recruiting workers to fill vacant jobs (Akgunduz et al., 2023). Another result indicated that the job-finding rate has declined for native individuals in the treatment area regions compared with individuals in control areas after the Syrian inflow. This indicates that the Beveridge curve shifted inwards due to the inflows of Syrians; in other words, this new group of workers raises matching efficiency and improves labor market conditions by reducing the number of unfilled vacancies and job seekers for the given unemployment rate in the Turkish labor market. Additionally, even when the overall effect of Syrians is negative, some occupations within sub-occupations are likely to face different consequences of Syrians due to both job

requirements and the characteristics of both Syrians and natives employed in these jobs. For this reason, the effect of the Syrian influx on the job vacancy rate and job-finding rate considering nine occupation groups were also investigated. The results of this analysis demonstrate that the rapid and unexpected influx of Syrians alleviated JVR and JFR in most of the groups. However, the non-random destination choices of migrants induce an endogeneity concern in the essay. To account for the endogeneity of Syrian settlement patterns, the IV approach prevalent in earlier studies (e.g., Aksu et al., 2022; Del Carpio and Wagner, 2015) was used. However, the analysis begins with the ordinary least squares (OLS) results to enable readers to compare them with the IV technique. Because OLS may be impacted by the endogeneity of Syrian placement decisions, which are likely connected with unobservable factors, it can produce spurious findings. Overall, the results suggest that the job vacancy rate in Türkiye diminished because of the Syrian inflows, representing a change that is often associated with more efficient matching due to a reduced mismatch between labor demand and labor supply. This also implies that they may have reduced firms' costs by eliminating the extra time and effort spent recruiting workers to fill vacant jobs (Akgunduz et al., 2023). The results also show that the job-finding rate declined in the labor market after the Syrian inflow. The results indicate that the Beveridge Curve shifted inwards due to the inflow of Syrians. The underlying reason may be that a new group of workers might have reduced the number of unfilled vacancies and job seekers for the given unemployment rate in the Turkish Labor market. Therefore, they might have raised matching efficiency and improved Labor market conditions.

The remainder of this essay is structured as follows. Section 2 advert to the history of Syrians in Türkiye. Section 3 reviews the previous literature in this area and outlines the theoretical perspectives that informed the present essay. Section 4 introduces the data, variables, estimating methods, and essay model. Section 5 presents the empirical findings of the Difference in Difference Method, Synthetic Control Method, and Instrumental Variable Approach. The final section reports the essay's conclusions and discusses the main findings and their implications.

## **3.2 History of Syrians in Türkiye**

The political turmoil in Syria, which started with anti-regime demonstrations in Deraa in March 2011, rapidly turned into a crisis, and people began to flee from Syria to neighboring countries: Lebanon 1,078,338 (25%), Jordan 629 627 (12%), North Iraq

245 585 (5%), and Egypt 128 019 (3%) (Erdogan and Unver 2015). The first mass population movements from Northern Syria to the Southeastern provinces of Türkiye came about on April 29, 2011, in the province of Hatay Yayladagı Cilvegözü border crossing in the village of 252 people. Since then, crossing through the border has partially declined but continues. Syrian cities where Syrians came from are usually close to the Turkish border. The percentage ratios of Syrians from each city are Aleppo (35.7%), Idlep (20.9%), Raqqa (10.9%), Latika (9.2%), Hassakeh (5.4%), and Hama (7.5%). The rest of them came from other cities far from the border (AFAD 2014). They were placed in modern accommodation centers (container and tent cities) where all the physical and social facilities were available. As of 26 October 2015, 10 – 12% of Syrians lived in camps in several border provinces of the southeastern region in Türkiye, while 88 – 90% lived outside the camps but still close by to access free healthcare, education, food, and other basic services provided by the Turkish government (Erdogan and Unver, 2015). A total of 25 refugee camps were established in the following ten provinces (with the number of Syrians in camps indicated in parentheses): Sanliurfa (104,890), Gaziantep (52,277), Kilis (33,651), Hatay (14,803), Kahramanmaras, (17,853), Mardin (15,740), Adana (10,598), Adiyaman (9,599), Osmaniye (9,160), and Malatya (7,813). Provinces with the highest Syrian population are Sanliurfa (356,390), Hatay (341,174), Istanbul (305,067), Gaziantep (277,905), Adana (121,851), Kilis (114,567), Mersin (114,148), Mardin (88,139), Izmir (73,314), and Kahramanmaras (72,653). Table 3.1 provides details on the ratio of the number of registered Syrians to the native population in each NUTS2 region and province in Türkiye as of the end of 2015, and Figure 3.5 illustrates these ratios on a map.

Table 3.1: Description of NUTS2-level Regional Division and Syrian Ratios in NUTS2 Regions in Türkiye as of the end of 2015.

| NUTS2 | NUTS2     | Provinces in NUTS2                              | Ratio of Syrians |
|-------|-----------|-------------------------------------------------|------------------|
| TR10  | Istanbul  | Istanbul                                        | 2.03             |
| TR21  | Tekirdag  | Tekirdag, Edirne, Kirlareli                     | 0.72             |
| TR22  | Balikesir | Balikesir, Canakkale                            | 0.22             |
| TR31  | Izmir     | Izmir                                           | 1.75             |
| TR32  | Aydin     | Aydin, Denizli, Mugla                           | 0.52             |
| TR33  | Manisa    | Manisa, Afyonkarahisar, Kutahya, Usak           | 0.22             |
| TR41  | Bursa     | Bursa, Eskisehir, Bilecik                       | 1.85             |
| TR42  | Kocaeli   | Kocaeli, Sakarya, Duzce, Bolu, Yalova           | 0.48             |
| TR51  | Ankara    | Ankara                                          | 0.80             |
| TR52  | Konya     | Konya, Karaman                                  | 1.60             |
| TR61  | Antalya   | Antalya, Isparta, Burdur                        | 0.19             |
| TR62  | Adana     | Adana, Mersin                                   | 6.05             |
| TR63  | Hatay     | Hatay, Kahramanmaras, Osmaniye                  | 14.33            |
| TR71  | Kirikkale | Kirikkale, Nevsehir, Aksaray, Nigde, Kirsehir   | 0.39             |
| TR72  | Kayseri   | Kayseri, Sivas, Yozgat                          | 1.39             |
| TR81  | Zonguldak | Zonguldak, Karabuk, Bartin                      | 0.03             |
| TR82  | Kastamonu | Kastamonu, Cankiri, Sinop                       | 0.07             |
| TR83  | Samsun    | Samsun, Tokat, Corum, Amasya                    | 0.11             |
| TR90  | Trabzon   | Trabzon, Ordu, Giresun, Rize, Artvin, Gumushane | 0.06             |
| TRA1  | Erzurum   | Erzurum, Erzincan, Bayburt                      | 0.04             |
| TRA2  | Agri      | Agri, Kars, Igrid, Ardahan                      | 0.08             |
| TRB1  | Malatya   | Malatya, Elazig, Bingol, Tunceli                | 1.08             |
| TRB2  | Van       | Van, Mus, Bitlis, Hakkari                       | 0.14             |
| TRC1  | Gaziantep | Gaziantep, Adiyaman, Kilis                      | 15.73            |
| TRC2  | Sanliurfa | Sanliurfa, Diyarbakir                           | 10.61            |
| TRC3  | Mardin    | Mardin, Siirt, Batman, Sirnak                   | 5.63             |

**Note:** NUTS2 regions with the highest density of Syrians are TRC1 (15.73%), TR63 (14.33%), and TRC2 (10.61%).

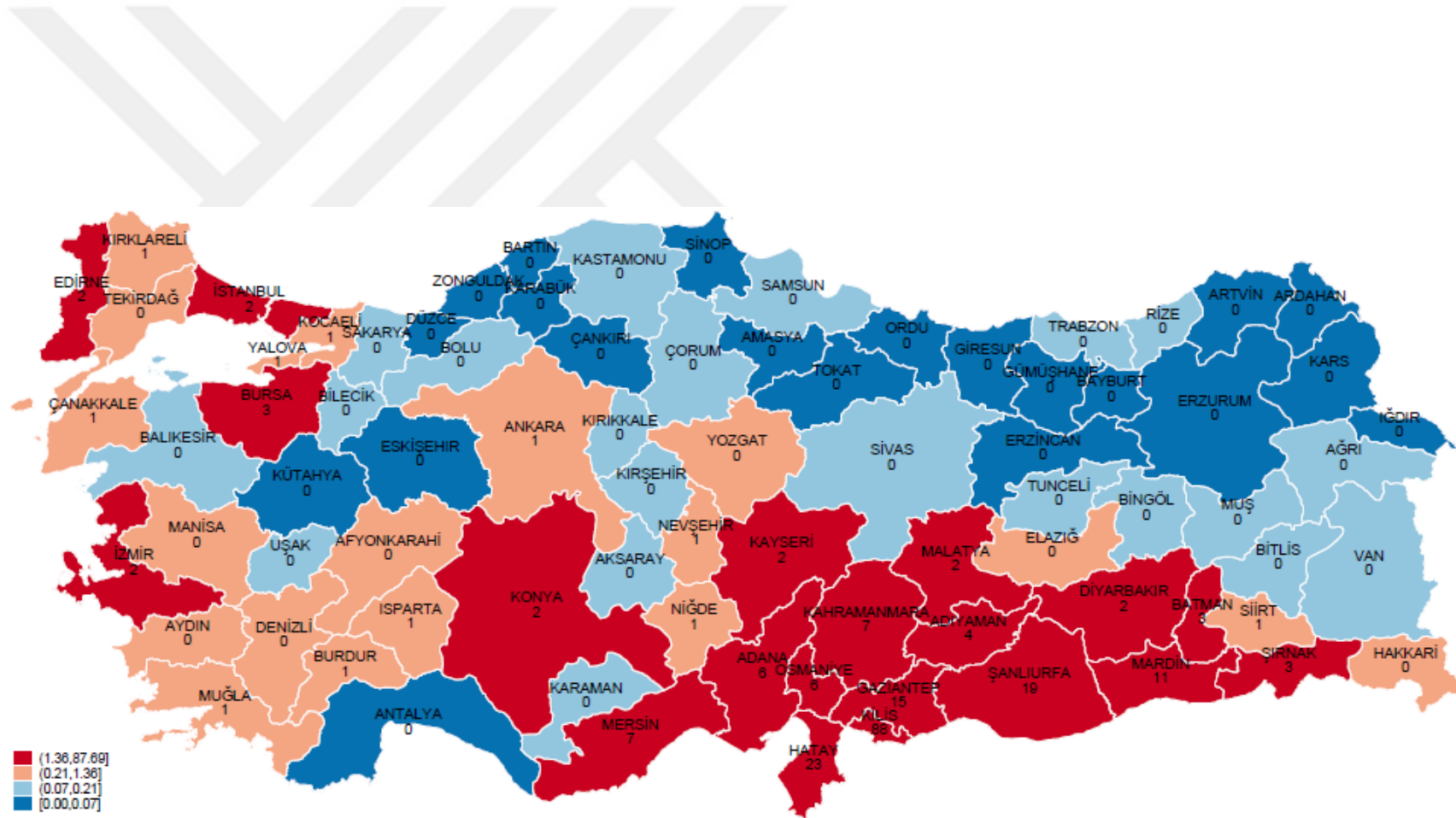


Figure 3.5: Ratio of Syrians to Turkish Population in 2015 (%).

It is quite apparent that Türkiye has become in every sense an extraordinary place after the Syrian crisis. There were two prominent reasons for the unexpected influx of Syrians to southeastern Türkiye (Balkan and Tumen 2016). Firstly, they preferred to inhabit provinces that were close to the Syrian border intending to return to their hometown easily after the civil war came to an end. Secondly, they choose provinces where the Turkish government official provides education, healthcare, child care, social/psychological support, and cash assistance for the Syrians. Furthermore, Syrians' demographic characteristics are similar to Turkish people living on the Syrian border. Most of them are in the age group 19–54. The gender distribution of immigrants is almost the same; %51.4 men and %48.6 female. They have low education levels (AFAD, 2014). On April 4, 2013, temporary protection regulation, which is arranged in accordance with international law, was brought into force. According to this regulation, Syrians do not have the opportunity to obtain a residence permit, a work permit, or apply for individual international protection. They generally find jobs in the informal market in southeastern Türkiye where informal employment opportunities are highly accessible to Syrians (Altindag et al. 2019, Ceritoglu et al. 2017).<sup>14</sup>

### **3.3 Literature Review**

#### **3.3.1 Theoretical Perspectives**

Labor market activities are often uncoordinated and costly. In this frictional environment, the interaction between companies and workers is indicated by a matching function. As in the production function, the matching function represents the number of successful matches formed in the labor market as the outputs of the function. According to the matching function, the inputs are defined as the number of vacancies announced by the companies ( $V$ ) and the number of unemployed seeking a job ( $U$ ). Accordingly, the output, or the number of matches in the Labor market ( $M$ ),

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<sup>14</sup> Some articles in the literature on Syrians in Türkiye are related to mental and physical health status (e.g., Korukcu et al., 2018, Ozel et al., 2018, Ozaras et al., 2016) and health related practices (e.g., Samari, 2017; Cift et al., 2019) access to services (e.g., Assi et al., 2019, Cantekin, 2019, Atesok et al., 2019, Taskin and Erdemli, 2018) and social cohesion (Alrawadieh et al., 2019, Shneikat and Alrawadieh, 2019, Doğan et al., 2019, Carpi and Senoguz, 2019). Moreover, socioeconomic effects of mass migration of Syrians on Türkiye have been a prominent research area. In this respect, effects on labor markets (Akgunduz et al., 2015, Del Carpio and Wagner, 2015, Tumen, 2016, Ceritoglu et al., 2017), consumer prices (Balkan and Tumen, 2016), youth education (Tumen, 2018a), housing rents and perceived crime (Balkan et al., 2018) were investigated. Perceptions of Turkish university students of their Syrian classmates (Ergin, 2016) was another subject studied by researchers.

can be expressed as follows:

$$M = Am(U, V) \quad M_U, M_V > 0 \quad (3.1)$$

where  $m$  is the matching function and  $A$  is the efficiency that converts inputs to output. The underlying idea of the matching function is that the higher the number of unemployed workers (or the number of vacancies advertised), the higher the number of matches. Some studies assert that this matching could be indicated by the Cobb-Douglas function with constant returns to scale (Elsby et al., 2015; Petrongolo and Pissarides, 2001). Therefore, the output—i.e., the number of matches in the labor market ( $M$ )—can also be expressed as:

$$M_{ij} = A_{ij} U_i^{\alpha_{ij}} V_j^{1-\alpha_{ij}} \quad (3.2)$$

In this approach, the matching function shows the unemployment status of the workers. In addition, the change in the average level of unemployment can be expressed as the difference between the workers who are moving towards unemployment and those who are leaving unemployment. At equilibrium (when the trend towards exiting unemployment and the trend towards entering unemployment are equal), the mean of unemployment is constant. In other words, given the matching function, layoffs ( $S$ ) are equal to new matches ( $M$ ). If we divide both sides of this equation by the size of the workforce ( $L$ ):

$$S/L = M/L = A(U/L)^\alpha (V/L)^{1-\alpha}$$

If the steady-state condition is valid, the equilibrium unemployment rate ( $u = U/L$ ) can be expressed as a function of the equilibrium job vacancies ( $v = V/L$ ). When incorporating the turnover rate ( $s$ ) as the equation becomes:

$$M/L = s = A(u)^\alpha (v)^{1-\alpha}$$

$$\ln(s) = \ln(A) + \alpha \ln(u) + (1 - \alpha) \ln(v)$$

$$[\ln(s) - \ln(A)]/\alpha = \ln(u) + [(1 - \alpha)/\alpha] \ln(v)$$

$$\ln(v) = \gamma - \beta \ln(u) + \varepsilon_t \quad (3.3)$$

$\gamma = [\ln(s) - \ln(A)]/\alpha$ ,  $\beta = (1 - \alpha)/\alpha$  and  $\varepsilon_t$  indicate error terms. This equation demonstrates the Beveridge Curve.

In the real world, when labor mobility within many other countries or among countries is considered, the unemployed laborers not only respond to the vacancy announcements in their region or country ( $i$ ) but also may respond to the vacancy

announcements in another region or country (j). In such a case, the matching function is indicated as follows:

$$M_{ij} = A_{ij} U_i^{\alpha_{ij}} V_j^{1-\alpha_{ij}} \quad (3.4)$$

$$\ln(u_{i,t}) = \gamma_{ij} - \beta_{ij} \ln(v_{j,t}) + \varepsilon_{ij,t} \quad (3.5)$$

Due to its matching function characteristics, the Beveridge Curve is convex—that is, it is negatively sloped and convex. If we assume that the step-down ratio remains constant during the employment cycle, then unemployment and vacancies are negatively correlated for the economy to move along the curve. While an outward shift of the Beveridge Curve is associated with a disruption in the matching process, an inward shift indicates that the matching process has improved (Petrongolo and Pissarides, 2001).

Under the assumption that the matching function has a constant return to scale, an unemployed worker finds a job with probability  $M = Am(U, V)$   $M_u, M_v > 0$  in a given period (Shimer, 2005; Petrongolo and Pissarides, 2001; Hobijn and Sahin, 2013). Then if we divide both sides of equation (3.1) by unemployment, we get equation (3.6) which is called the Job Finding Rate (JFR). Thus, the job-finding rate was considered as a dependent variable while investigating how Syrians affect the Beveridge Curve as conducted by Anastasopoulos et al., (2021)'s article.

$$\frac{M_{ij}}{U_i} = A_{ij} \left(\frac{V_j}{U_i}\right)^{1-\alpha_{ij}} \quad (3.6)$$

$$JFR = \ln\left(\frac{M_{ij}}{U_i}\right) = \ln A_{ij} + (1 - \alpha_{ij}) \ln\left(\frac{V_j}{U_i}\right) \quad (3.7)$$

$$JFR = \ln\left(\frac{M_{ij}}{U_i}\right) = \lambda_{ij} - \alpha_{ij} \ln\left(\frac{V_j}{U_i}\right) + \varepsilon_{ij,t} \quad (3.8)$$

### 3.3.2 Studies on the Impact of Immigration on the Beveridge Curve

Micro- and macroeconomics have paid significant attention to labor matching because it enhances economists' understanding of the relationship between labor market efficiency and job creation (e.g., Albert, 2021; Atalay et al., 2020; Mercan and Schoefer, 2020). One approach to studying labor market efficiencies is the Beveridge Curve analysis, which describes the negative correlation of job vacancies with unemployment.

The Beveridge Curve, which indicates negative comovement between unemployment and vacancies, was introduced by William Beveridge to demonstrate

the variation in frictions and mismatches in the labor market. Dow and Dicks Mireaux (1958) formalized the curve, which later underwent a remarkable transformation by Rodenburg (2011). The Beveridge Curve was used to distinguish structural from cyclical unemployment (Jackman et al., 1990). Eventually, the theoretical framework of the Beveridge Curve gained popularity with Mortensen and Pissarides' (1999) labor market model. According to their hypothesis, the Beveridge Curve is a downward-sloping steady-state relationship between the vacancy rate and the unemployment rate. Initially, movements along the curve could be expressed by the business cycle and attributed to times of recession or expansion. For instance, while an upward ride along the curve corresponds with higher vacancies and lower unemployment in expansionary times, the opposite occurs when the economy deteriorates. However, some scholars refute this idea, claiming that the distance of the Beveridge Curve to the origin is also affected by business cycle circumstances (Börsch-Supan, 1991; Wall and Zoega, 2002) and structural factors influencing the matching of vacant jobs and unemployed workers (Pissarides, 2003). Such structural factors include changes in the form of layoffs or separations, changes in the labor force composition (movements between inactivity and activity), and changes in matching efficiency. While the former two factors could cause a transitory shift, the latter induces a permanent shift in Beveridge Curve. Solow (2000) argued that the Beveridge Curve's distance from the origin implies the measurement of labor market inefficiency. For example, as vacancies remain constant and unemployment rises, the Beveridge Curve moves outward, thereby decreasing labor market efficiency and causing mismatches between available vacancies and unemployment. The shifts in the Beveridge Curve and underlying mechanisms that induce such movements have been extensively studied in the economic literature, which has ultimately concluded that the curve varies greatly between countries and changes over time (e.g., Hobjin and Sahin, 2013).

Moreover, exogenous variations in the labor supply affect the location of the Beveridge curve. Diamond and Blanchard (1989) were the first to consider the role of labor supply shocks, arguing that there is a positive conditional connection between employment and unemployment. With this identifying conjecture, they indicated that a greater labor supply leads to increased matching and a resulting decrease in posted vacancies. Advanced matching encourages new hiring (labor demand), resulting in a rise in vacancies and a decline in unemployment. Accordingly, labor supply shocks induce a counterclockwise rotation in the Beveridge Curve. Recent studies have

addressed this issue in the context of job-related migration. Anastasopoulos et al., (2020) examined the effect of immigration on the quantitative relationship between the job vacancy rate and unemployment rate. They established that the Beveridge Curve in the US cities shifted inwards during a period of increased migration, which could be attributed to increased job matches between workers and available job opportunities, or the changing demographics of the labor market after the Mariel supply shock in 1980. Maffei-Faccioli and Vella (2021) investigated the macroeconomics and labor market implications of mixed migration flows in Germany between 2006–2019, which included economic migrants, refugees, asylum seekers, and others. They found that these migration shocks increased job vacancies because they spurred the creation of additional jobs and a reduction in unemployment for natives, as estimated by the Beveridge Curve's inverse relationship. Also, Schiman (2021) indicated that the inward shift of the Beveridge Curve in Austria was driven by labor supply shock stemming from job-related immigration. The largest impact is found in the locations nearest to the migrant workers' home countries.

Although several articles investigated Türkiye's Beveridge Curve (e.g., Kanik et al., 2014; Saglam and Günalp, 2011; Büyükbasaran, 2020; Ozcelik and Akıncı, 2020; Bari and Sıklar, 2020), and none have specifically examined the effects of Syrians on labor market efficiency within the scope of the Beveridge Curve. After the massive and sudden inflow of Syrians in Türkiye, as labor supply shocks increase the number of job searchers, the competition for available positions heightens. This may make it much harder for existing job applicants (the unemployed) to be matched to a vacancy, hence increasing the stock of unemployed natives in response to given vacancies. On the other hand, a greater supply of labor willing to work for lower wages may allow businesses to fill vacancies more quickly, boosting the stock of employment while lowering the stock of vacancies. The labor supply shock reduces wages while increasing labor demand, which may bolster employment, even more, encourage vacancy postings, and reduce the elevated level of unemployment. Consequently, a negative coefficient is expected. A negative coefficient means an inward shift of the Beveridge Curve, which suggests increased efficiency. Furthermore, even when the overall effect of Syrians is negative, some sub-occupations may face different consequences of an influx of migrants, both due to job requirements and the characteristics of the Syrians and natives employed in these jobs. For this reason, the magnitude of efficiency in the job matching process varies according to the

characteristics of individual occupations (e.g., whether labor-intensive or technology-intensive) as well as those occupations' demographic composition (e.g., whether male- or female-dominated, education level, age structure, etc.). Accordingly, the effect of the Syrian influx on the job vacancy rate and job-finding rate considering nine occupation groups were also investigated. The hypotheses of the essay according to this framework are as follows:

H<sub>1</sub>: Syrians lead to a decrease in the job vacancy rate in Türkiye.

H<sub>2</sub>: Syrians lead to a decrease in the job vacancy rate for sub-occupations in Türkiye.

H<sub>3</sub>: Syrians lead to an inward shift in Beveridge Curve in Türkiye.

H<sub>4</sub>: Syrians lead to an inward shift in Beveridge Curve for sub-occupations in Türkiye.

## **3.4 Methodology**

### **3.4.1 Data and Variables**

Previous studies focusing on the involuntary influx of Syrians to Türkiye utilized the NUTS2 classification from Eurostat (e.g., Balkan and Tumen, 2016; Tumen, 2016).<sup>15</sup> Namely, at the NUTS2-level regional division, the treatment group in articles includes TR62 (Adana and Mersin), TR63 (Hatay, Kahramanmaraş, and Osmaniye), TRC1 (Gaziantep, Adıyaman, and Kilis), TRC2 (Sanliurfa and Diyarbakir), and TRC3 (Mardin, Batman, Şırnak, and Siirt) and the control group includes TRA1 (Erzurum, Erzincan, and Bayburt), TRA2 (Ağrı, Kars, Iğdır, and Ardahan), TRB1 (Malatya, Elazığ, Bingöl, and Tunceli), and TRB2 (Van, Muş, Bitlis, and Hakkari).<sup>16</sup> To make the essay comparable with other studies in this area, the treatment and control groups were formed in line with those of the previous studies. The treatment area included 14 provinces from the southeastern part of Türkiye where the proportion of Syrians to the general population was above 2% (AFAD, 2014), and the control area included 15 provinces. The provinces in the control area, where the ratio of the number of Syrians to the population was close to zero, have similar cultural properties, socio-demographic characteristics, and levels of economic development to those of the

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<sup>15</sup> In 2002, TurkStat implemented the Nomenclature of Territorial Units for Statistics (NUTS) within the framework of the EU accession period. There are three NUTS classifications for Türkiye: NUTS1 (12 regions), NUTS2 (26 subregions), and NUTS3 (81 provinces).

<sup>16</sup> Table 3.1 present the details of the NUTS2-level regional categorization for Türkiye.

treatment area. Thus, Turkish NUTS2 regions can be considered homogeneous and integrated in terms of local labor markets. Figure 3.6 illustrates treatment and control areas in the map of Türkiye.





The present essay uses yearly province-level vacancies and job placement figures collected by the Turkish Employment Agency (ISKUR) between 2009–2018. The province-level data was aggregated by the authors according to the NUTS2-level regional categorization for Türkiye as the control variables in the essay are available at the NUTS2-level. ISKUR is a public recruitment institution that works to protect, develop, and promote employment nationally. Foreign individuals with work permits in Türkiye can work under an employer and access ISKUR services directly through [www.iskur.gov.tr](http://www.iskur.gov.tr), or by visiting the nearest ISKUR Service Center and registering with the ISKUR. After registration, individuals are assigned a vocational counselor to assist them in the job-finding process. These counselors assist job seekers with matters such as job search, job placement, career choice, job change, and gaining work experience (Ministry Interior of Türkiye, 2022). The number of registered unemployed foreign nationals seeking a job through ISKUR was 23,809 in 2018, 50,532 in 2019, 28,458 in 2020, and 31,552 in 2021 (pre-2018 statistics are not available). Since the employers cannot enter the citizenship information of the applicants into the system, the exact citizenship information of the applicants is not known. In light of this information, the essay’s dataset can be considered representative. Further information about Turkish Employment Agency (ISKUR) data is available in Yucel (2015).<sup>17</sup>

The national job vacancy rate (JVR) was measured in accordance with EUROSTAT as follows:

$$JVR = \left( \frac{\text{Number of Job Vacancies}}{\text{Number of Job Placement} + \text{Number of Job Vacancies}} \right) * 100$$

The Beveridge Curve is obtained from the matching function, which depicts the matching of job seekers to job vacancies. If the matching function has a constant return to scale, it becomes a special function called the Job Finding Rate (JFR), which shows the tightness or slackness of the labor market (e.g., Anastasopoulos et al., 2020). Thus, the job-finding rate was considered as a dependent variable while investigating how Syrians affect the Beveridge Curve. The national job-finding rate (JFR) is defined as the division of the JVR by the unemployment rate at the NUTS2-level region (Anastasopoulos et al., 2020; Shimer, 2005). To analyze the data, logarithms of the

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<sup>17</sup> The number of unemployed is generally used as a proxy for total job seekers.

JVR and JFR, both overall and for nine specific occupations, were identified.<sup>18</sup> Unemployment rate data at the NUTS2-level for the nine-year period was obtained from the Turkish Statistical Institute (TurkStat). Figure 3.7 depicts trends in unemployment and job vacancy rates (JVR) in the treatment and control areas. Until 2012, they all experienced an expansion, with the unemployment rate declining by 4,5 percentage points and JVR slightly rising. While the difference between the two variables increased between 2012 and 2017, after 2017, the two indicators had grown closer.

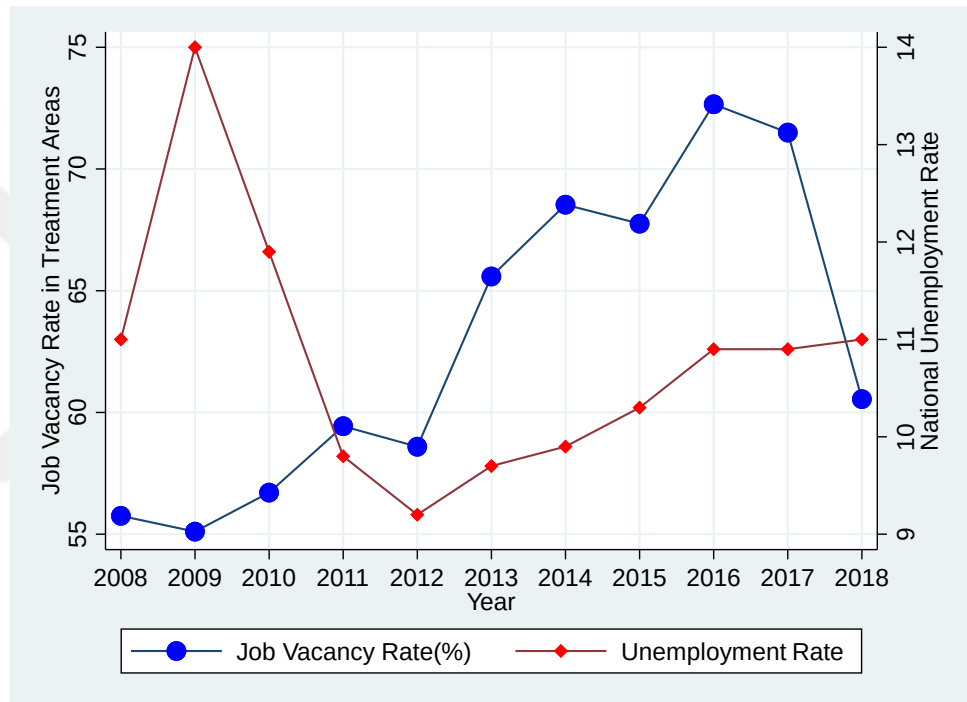


Figure 3.7: Job Vacancy Rate and Unemployment Rate in Treatment and Control Areas.

<sup>18</sup> ISKUR utilizes the Structure of the International Standard Classification of Industry (ISCO-08), which was introduced by the International Labor Organization for classifying industry groups.

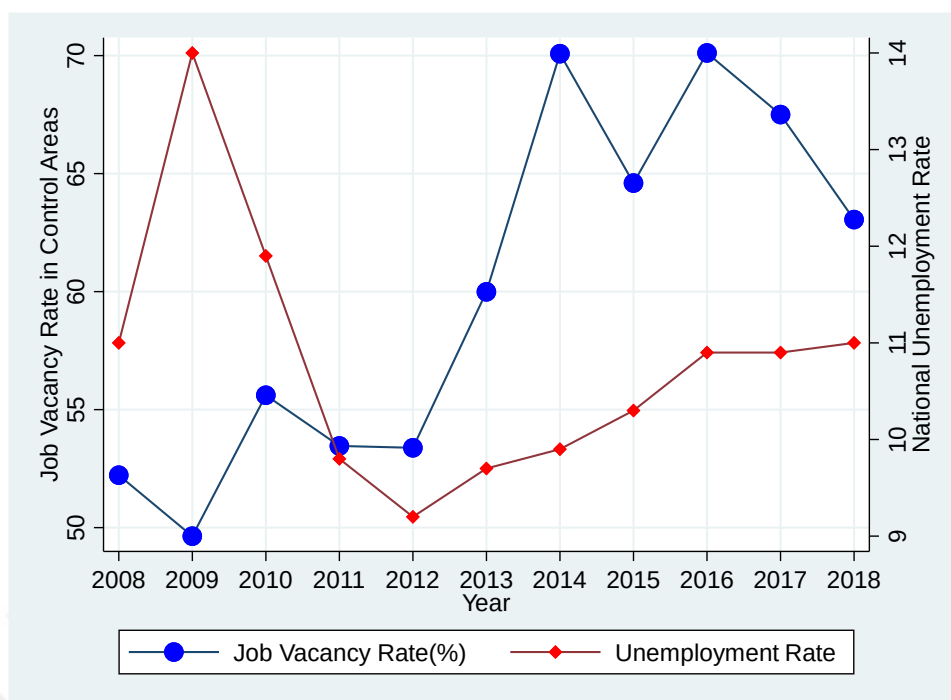


Figure 3.7: Job Vacancy Rate and Unemployment Rate in Treatment and Control Areas (Continued).

Following the methodology of Anastasopoulos et al. (2020), the following explanatory variables in the essay were calculated for individuals in the working-age range (15–64): unemployment rate, percentage of workers in education, occupational distribution of workers, percent growth in the number of workers employed in each occupation, a ratio of male workers, percent growth in the number of male workers, the ratio of female workers, and percent growth in the number of female workers in each of NUTS2-level regions between 2009–2018. Furthermore, as the civil war influenced production activities in Syria, this country’s trade with Türkiye, especially exports to the provinces bordering Syria where the percentage of Syrians is greatest, has dramatically increased (Ferris and Kirisci, 2016). This situation could also influence Syrians’ impact on the labor market and the outcomes for natives; thus, following the design of previous studies, the logarithm of the NUTS2-level regional real trade volumes was included in the models (e.g., Aksu et al., 2018; Tumen, 2021).<sup>19</sup> Moreover, when studying a phenomenon like the Beveridge Curve, it is critical to foreground the macroeconomic context of the period of the essay; thus, the logarithm of the NUTS2-level real GDP per capita was added to the analysis. Lastly, since

<sup>19</sup> The export and import data were summed up and deflated these figures with the Consumer Price Index.

informal employment is relatively high in the affected regions and became more widespread due to the informal employment of Syrians, fewer vacancies may have been posted and filled through the ISKUR during the period under investigation. To acknowledge this issue, the proportion of individuals working informally in the labor market was incorporated by utilizing data from the Household Labor Force Survey according to both years and occupations.

Table 3.2 gives information on the definition of variables used in the analysis. Table 3.3 provides descriptive statistics of the variables used in the essay's analysis.

National JVR (log): This refers to the national job vacancy rate in logarithmic form. The mean for the 2009-2015 period is 4.138, and the standard deviation is 0.111. The mean for the 2009-2018 period is 4.163, and the standard deviation is 0.107.

National JFR (log): This refers to the national job filling rate in the logarithmic form. The mean for the 2009-2015 period is 1.911, and the standard deviation is 0.426. The mean for the 2009-2018 period is 1.937, and the standard deviation is 0.430.

Informal (%): This refers to the percentage of workers in the informal sector. The total mean for the 2009-2015 period is 46.180%, with a standard deviation of 14.414%. The total mean for the 2009-2018 period is 44.328%, with a standard deviation of 14.124%. The percentage of informal workers is also provided for each occupation. Professionals had the lowest average informality ratio, and skilled agricultural, forestry, and fishery occupations had the highest average informality ratio. In the long term, the means of all the JVR and JFR variables were 4.163 and 1.937, respectively.

Real GDP per capita (log): This refers to the real gross domestic product per capita in logarithmic form. The mean for the 2009-2015 period is 9.541, and the standard deviation is 0.384. The mean for the 2009-2018 period is 9.599, and the standard deviation is 0.388.

Real Trade Volume (log): This refers to the real trade volume in logarithmic form. The mean for the 2009-2015 period is 11.760, and the standard deviation is 0.757. The mean for the 2009-2018 period is 11.920, and the standard deviation is 0.795.

Education Level (%): This refers to the percentage of the population with an education. The mean for the 2009-2015 period is 96.691%, with a standard deviation of 1.876%. The mean for the 2009-2018 period is 97.153%, with a standard deviation of 1.764%.

Unemployment Rate (%): This refers to the unemployment rate. The mean for the 2009-2015 period is 10.015%, with a standard deviation of 4.092%. The mean for the 2009-2018 period is 10.075%, with a standard deviation of 4.349%.

Finally, the average ratio of male and female workers was 63.87% and 26.46%. The distributions of workers were nearly 40% in agriculture, 23% in industry, and 46% in service; and the growth in the number of workers employed in these occupations was 34%, 24%, and 12%, respectively. Other statistics had a similar tendency to these short-term statistics.



Table 3.2: Definition of Variables Using Study.

| Variables                                                | Definition                                                                                          | Source   |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------|
| <i>The main outcome of interest</i>                      |                                                                                                     |          |
| Job vacancies <sup>1</sup>                               | Employer requests for workers received by the Institution from                                      | ISKUR    |
| Job placement <sup>1</sup>                               | Job placement means that employers' requests for workers are met by the Institution.                |          |
| Job vacancy rate <sup>2</sup>                            | The division of job vacancies figures to the sum of job vacancies and job placements.               |          |
| <i>Key independent variable</i>                          |                                                                                                     |          |
| Unemployment Rate (%) <sup>3</sup>                       | The ratio of unemployed individuals.                                                                | TurkStat |
| <i>Controls</i>                                          |                                                                                                     |          |
| Real GDP per capita (log)                                | The logarithm of Real Gross Domestic Product per capita.                                            |          |
| Real Trade Volume (log)                                  | The logarithm of a deflated total of export and import with the Consumer Price Index.               |          |
| Education Level (%)                                      | The ratio of educated workers.                                                                      |          |
| Distribution of workers in agriculture (%)               | The ratio of workers in agriculture, industry, and service sectors.                                 |          |
| Distribution of workers in the industry (%)              |                                                                                                     |          |
| Distribution of workers in service (%)                   |                                                                                                     |          |
| Growth in the number of workers employed in agriculture  | The percent growth in the number of workers employed in agriculture, industry, and service sectors. |          |
| Growth in the number of workers employed in the industry |                                                                                                     |          |
| Growth in the number of workers employed in service      |                                                                                                     |          |
| The ratio of workers who are male (%)                    | The fraction of male and female workers.                                                            |          |
| The ratio of workers who are female (%)                  |                                                                                                     |          |
| Growth in the number of male workers                     | The percent growth in the number of female and male workers.                                        |          |
| Growth in the number of female workers                   |                                                                                                     |          |
| Informal (%)                                             | The proportion of individuals working informally in the Labor market.                               | LFS      |

<sup>1</sup><https://www.iskur.gov.tr/kurumsal-bilgi/istatistikler/>

<sup>2</sup>EUROSTAT definition is used (Source: <https://ec.europa.eu/eurostat/web/Labor-market/job-vacancies>).

<sup>3</sup>According to TurkStat, the unemployed are "individuals aged 15 and over who are not employed in the reference period (who have never worked for profit, wage, salaried or unpaid and have no connection with such a job), who have used at least one of the job search channels in the last 4 weeks\* to look for a job and who can start work within 2 weeks" (TurkStat, 2017). \*Prior to 2014, "last 3 months" was used instead of "last 4 weeks"

Abbreviations: LFS= Household Labor Force Survey, ISKUR = Turkish Employment Agency, TurkStat =Turkish Statistical Institute

<sup>1</sup><https://www.iskur.gov.tr/kurumsal-bilgi/istatistikler/>

<sup>2</sup>EUROSTAT definition is used (Source: <https://ec.europa.eu/eurostat/web/Labor-market/job-vacancies>).

<sup>3</sup>According to TurkStat, the unemployed are "individuals aged 15 and over who are not employed in the reference period (who have never worked for profit, wage, salaried or unpaid and have no connection with such a job), who have used at least one of the job search channels in the last 4 weeks\* to look for a job and who can start work within 2 weeks" (TurkStat, 2017). \*Prior to 2014, "last 3 months" was used instead of "last 4 weeks"

Abbreviations: LFS= Household Labor Force Survey, ISKUR = Turkish Employment Agency, TurkStat =Turkish Statistical Institute

Table 3.3: Summary Statistics for the Sample Used in the Analysis.

| Variables                                               | 2009–2015 |        | 2009–2018 |        |
|---------------------------------------------------------|-----------|--------|-----------|--------|
|                                                         | Mean      | SD     | Mean      | SD     |
| National JVR (log)                                      | 4.138     | 0.111  | 4.163     | 0.107  |
| National JFR (log)                                      | 1.911     | 0.426  | 1.937     | 0.430  |
| <i>JVR (log)</i>                                        |           |        |           |        |
| Clerical Support Occupations                            | 4.167     | 0.110  | 4.179     | 0.104  |
| Services and Sales Occupations                          | 4.186     | 0.102  | 4.195     | 0.098  |
| Elementary Occupations                                  | 4.091     | 0.118  | 4.120     | 0.118  |
| Skilled Agricultural, Forestry, and Fishery Occupations | 4.149     | 0.240  | 4.165     | 0.219  |
| Professionals                                           | 4.273     | 0.116  | 4.275     | 0.108  |
| Craft and Related Trades Occupations                    | 4.208     | 0.134  | 4.233     | 0.127  |
| Technicians and Associate Professionals                 | 4.251     | 0.121  | 4.267     | 0.113  |
| Plant and Machine Operators and Assemblers              | 4.173     | 0.125  | 4.202     | 0.124  |
| Managers                                                | 4.244     | 0.162  | 4.274     | 0.155  |
| Informal (%)                                            |           |        |           |        |
| Total                                                   | 46.180    | 14.414 | 44.328    | 14.124 |
| Clerical Support Occupations                            | 10.439    | 5.353  | 9.315     | 5.066  |
| Services and Sales Occupations                          | 40.340    | 12.016 | 38.953    | 11.410 |
| Elementary Occupations                                  | 53.444    | 15.821 | 51.936    | 15.914 |
| Skilled Agricultural, Forestry, and Fishery Occupations | 78.708    | 13.589 | 78.236    | 13.345 |
| Professionals                                           | 3.273     | 1.822  | 3.419     | 1.839  |
| Craft and Related Trades Occupations                    | 41.386    | 14.392 | 39.402    | 13.593 |
| Technicians and Associate Professionals                 | 10.829    | 4.869  | 10.541    | 4.461  |
| Plant and Machine Operators and Assemblers              | 24.610    | 12.781 | 22.960    | 11.852 |
| Managers                                                | 22.956    | 12.568 | 21.004    | 11.561 |
| Real GDP per capita (log)                               | 9.541     | 0.384  | 9.599     | 0.388  |
| Real Trade Volume (log)                                 | 11.760    | 0.757  | 11.920    | 0.795  |
| Education Level (%)                                     | 96.691    | 1.876  | 97.153    | 1.764  |
| Unemployment Rate (%)                                   | 10.015    | 4.092  | 10.075    | 4.349  |
| Distribution of workers in agriculture (%)              | 30.951    | 14.695 | 29.603    | 14.446 |
| Distribution of workers in the industry (%)             | 23.162    | 8.404  | 23.408    | 8.186  |
| Distribution of workers in service (%)                  | 45.887    | 9.829  | 46.990    | 9.852  |
| Growth in the number of workers employed in agriculture | 0.342     | 0.455  | 0.342     | 0.454  |
| Growth in the number of workers employed in industry    | 0.246     | 0.388  | 0.246     | 0.388  |
| Growth in the number of workers employed in service     | 0.125     | 0.147  | 0.125     | 0.147  |
| The ratio of workers who are male (%)                   | 63.873    | 4.792  | 64.101    | 4.763  |
| Growth in the number of male workers                    | 0.120     | 0.092  | 0.120     | 0.092  |
| The ratio of workers who are female (%)                 | 26.466    | 8.164  | 27.070    | 7.769  |
| Growth in the number of female workers                  | 0.345     | 0.384  | 0.345     | 0.384  |

Table 3.4 provides summary statistics for the sample used in the analysis, divided into treatment and control regions. The data is presented for two time periods: 2009-2012 and 2013-2018. The mean and standard deviation (SD) are calculated for each variable.

The first set of variables presented in the table pertains to the job vacancy rate (JVR) and the job filling rate (JFR) at the national and local levels. The treatment area shows a higher JVR compared to the control area in both time periods. The JFR in the treatment area was much lower in 2009-2012, with a mean of 1.445 and SD of 0.322, compared to 7.920 in 2013-2018 with an SD of 0.891. This is in contrast to the control area, where the JFR in 2009-2012 was 1.690 with an SD of 0.364 and 7.752 in 2013-2018 with an SD of 0.591.

Next, the JVR for various occupational categories is presented for the treatment area. The categories include clerical support workers, services and sales workers, elementary occupations, skilled agricultural, forestry, and fishery workers, professionals, craft and related trades workers, technicians and associate professionals, plant and machine operators and assemblers, and managers. In both time periods, professionals had the highest JVR mean, while elementary occupations had the lowest. The JVR in each occupation increased in the 2013-2018 period compared to 2009-2012, with some categories such as managers and craft and related trades workers showing a greater increase.

The table then presents data on the informal sector as a percentage of the total workforce in each region. The treatment area shows a higher percentage of informal workers in both time periods compared to the control area. For the treatment area, skilled agricultural, forestry, and fishery workers had the highest percentage of informal workers, while professionals had the lowest. The percentage of informal workers decreased in the 2013-2018 period compared to 2009-2012 in all categories except professionals.

Real GDP and real trade volume are also presented for both regions. The treatment area had higher mean values for both variables in both time periods compared to the control area. The mean values of both variables increased in the 2013-2018 period compared to 2009-2012 in both regions.

Education level and unemployment rate are presented for each region. The treatment area had a higher education level mean and a lower unemployment rate means compared to the control area in both time periods. Both regions show an

increase in education level mean and unemployment rate mean in the 2013-2018 period compared to 2009-2012.

The distribution of workers in agriculture, industry, and service sectors is also presented for both regions. In both time periods, the treatment area had a higher percentage of workers in the service sector and a lower percentage in agriculture compared to the control area. The percentage of workers in the service sector increased in the treatment area in the 2013-2018 period, while the percentage of workers in agriculture decreased. The control area showed little change in the distribution of workers in each sector.

Finally, the table presents data on the growth in the number of male and female workers in each region. Both regions showed an increase in the number of male and female workers in both time periods. The treatment area had a higher ratio of male to female workers in both time periods, with the difference becoming less pronounced in the 2013-2018 period.

In summary, Table 3.4 provides a detailed overview of used in agriculture, industry, and service sectors were 26.857%, 23.885%, and 49.230%, respectively, in the control area from 2009 to 2012. However, during the period from 2013 to 2018, the distribution of workers in the agriculture, industry, and service sectors was 22.783%, 24.617%, and 52.597%, respectively, in the control area. Growth in the number of workers employed in agriculture, industry, and service sectors were 0.148, 0.269, and 0.329, respectively, during both periods in the control area. The ratio of male workers in the control area was 58.025% from 2009 to 2012 and 58.523% from 2013 to 2018. The growth in the number of male workers was 0.216 during both periods in the control area. The ratio of female workers in the control area was 15.310% from 2009 to 2012 and 18.247% from 2013 to 2018. The growth in the number of female workers was 0.498 during both periods in the control area.

Overall, Table 3.4 provides a comprehensive summary of the sample used in the analysis, divided into treatment and control regions. The table includes a range of variables such as mean, standard deviation, and percentage for the different sectors and industries. The data from the sample provides valuable insight into the characteristics of the regions, which are likely to impact the effectiveness of the treatment program. The information can be useful for policy-makers and researchers who want to study the effectiveness of the treatment program in different regions and sectors.

Table 3.4: Summary Statistics for the Sample Used in the Analysis, by Treatment and Control Regions.

|                                                     | 2009–2012 |        | 2013–2018 |        |
|-----------------------------------------------------|-----------|--------|-----------|--------|
|                                                     | Mean      | SD     | Mean      | SD     |
| <b>Treatment Area</b>                               |           |        |           |        |
| National JVR (log)                                  | 4.035     | 0.066  | 4.218     | 0.064  |
| National JFR (log)                                  | 1.445     | 0.322  | 7.920     | 0.891  |
| <i>JVR (log)</i>                                    |           |        |           |        |
| Clerical Support Workers                            | 4.094     | 0.068  | 4.218     | 0.090  |
| Services and Sales Workers                          | 4.125     | 0.089  | 4.236     | 0.092  |
| Elementary Occupations                              | 3.997     | 0.060  | 4.154     | 0.094  |
| Skilled Agricultural, Forestry, and Fishery Workers | 4.055     | 0.226  | 4.211     | 0.177  |
| Professionals                                       | 4.182     | 0.124  | 4.272     | 0.093  |
| Craft and Related Trades Workers                    | 4.070     | 0.100  | 4.290     | 0.081  |
| Technicians and Associate Professionals             | 4.214     | 0.105  | 4.276     | 0.086  |
| Plant and Machine Operators and Assemblers          | 4.087     | 0.105  | 4.278     | 0.081  |
| Managers                                            | 4.202     | 0.177  | 4.315     | 0.132  |
| <i>Informal (%)</i>                                 |           |        |           |        |
| Total                                               | 57.371    | 5.389  | 46.657    | 9.586  |
| Clerical Support Workers                            | 16.841    | 5.393  | 9.935     | 3.898  |
| Services and Sales Workers                          | 54.534    | 7.128  | 47.512    | 8.360  |
| Elementary Occupations                              | 75.392    | 5.631  | 60.763    | 11.657 |
| Skilled Agricultural, Forestry, and Fishery Workers | 86.47     | 8.012  | 80.778    | 7.331  |
| Professionals                                       | 3.787     | 2.171  | 4.437     | 2.019  |
| Craft and Related Trades Workers                    | 61.385    | 9.145  | 49.995    | 9.410  |
| Technicians and Associate Professionals             | 17.787    | 4.263  | 14.122    | 3.565  |
| Plant and Machine Operators and Assemblers          | 39.029    | 11.103 | 29.939    | 11.214 |
| Managers                                            | 41.617    | 12.770 | 22.007    | 7.823  |

Table 3.4: Summary Statistics for the Sample Used in the Analysis, by Treatment and Control Regions

(Continued).

|                                                          |        |       |        |       |
|----------------------------------------------------------|--------|-------|--------|-------|
| Real GDP (log)                                           | 9.140  | 0.220 | 9.380  | 0.224 |
| Real Trade Volume (log)                                  | 11.735 | 0.486 | 12.244 | 0.516 |
| Education Level (%)                                      | 95.264 | 1.645 | 98.259 | 0.812 |
| Unemployment Rate (%)                                    | 13.880 | 4.053 | 15.637 | 5.649 |
| Distribution of workers in agriculture (%)               | 26.857 | 5.600 | 22.783 | 7.792 |
| Distribution of workers in the industry (%)              | 23.885 | 5.715 | 24.617 | 5.156 |
| Distribution of workers in service (%)                   | 49.230 | 7.016 | 52.597 | 6.536 |
| Growth in the number of workers employed in agriculture  | 0.148  | 0.302 | 0.148  | 0.300 |
| Growth in the number of workers employed in the industry | 0.269  | 0.227 | 0.269  | 0.225 |
| Growth in the number of workers employed in service      | 0.329  | 0.138 | 0.329  | 0.137 |
| The ratio of workers who are male (%)                    | 58.025 | 5.930 | 58.523 | 5.663 |
| Growth in the number of male workers                     | 0.216  | 0.087 | 0.216  | 0.087 |
| The ratio of workers who are female (%)                  | 15.310 | 8.000 | 18.247 | 5.782 |
| Growth in the number of female workers                   | 0.498  | 0.518 | 0.498  | 0.514 |
| <b>Control Area</b>                                      |        |       |        |       |
| National JVR (log)                                       | 3.973  | 0.066 | 4.190  | 0.068 |
| National JFR (log)                                       | 1.690  | 0.364 | 7.752  | 0.591 |
| <i>JVR (log)</i>                                         |        |       |        |       |
| Clerical Support Workers                                 | 4.055  | 0.132 | 4.164  | 0.083 |
| Services and Sales Workers                               | 4.049  | 0.096 | 4.221  | 0.065 |
| Elementary Occupations                                   | 3.941  | 0.081 | 4.135  | 0.089 |
| Skilled Agricultural, Forestry, and Fishery Workers      | 3.862  | 0.465 | 4.230  | 0.192 |
| Professionals                                            | 4.117  | 0.108 | 4.284  | 0.078 |
| Craft and Related Trades Workers                         | 4.051  | 0.112 | 4.282  | 0.094 |
| Technicians and Associate Professionals                  | 4.102  | 0.071 | 4.268  | 0.077 |
| Plant and Machine Operators and Assemblers               | 4.023  | 0.095 | 4.267  | 0.089 |

Table 3.4: Summary Statistics for the Sample Used in the Analysis, by Treatment and Control Regions  
(Continued).

|                                                          |        |        |        |        |
|----------------------------------------------------------|--------|--------|--------|--------|
| Managers                                                 | 4.078  | 0.200  | 4.288  | 0.138  |
| <i>Informal (%)</i>                                      |        |        |        |        |
| Total                                                    | 64.361 | 35.730 | 58.430 | 10.450 |
| Clerical Support Workers                                 | 12.75  | 5.767  | 5.345  | 3.186  |
| Services and Sales Workers                               | 52.008 | 16.121 | 44.043 | 11.592 |
| Elementary Occupations                                   | 58.153 | 14.110 | 47.191 | 14.451 |
| Skilled Agricultural, Forestry, and Fishery Workers      | 93.206 | 3.872  | 91.6   | 4.682  |
| Professionals                                            | 1.087  | 0.533  | 2.457  | 1.173  |
| Craft and Related Trades Workers                         | 59     | 14.191 | 45.817 | 8.768  |
| Technicians and Associate Professionals                  | 10.998 | 4.875  | 9.034  | 2.958  |
| Plant and Machine Operators and Assemblers               | 40.411 | 15.876 | 29.164 | 11.692 |
| Managers                                                 | 35.730 | 12.559 | 21.83  | 6.841  |
| Real GDP (log)                                           | 9.050  | 0.244  | 9.265  | 0.231  |
| Real Trade Volume (log)                                  | 10.639 | 0.298  | 11.072 | 0.365  |
| Education Level (%)                                      | 94.183 | 2.632  | 98.090 | 1.157  |
| Unemployment Rate (%)                                    | 10.362 | 3.659  | 7.992  | 3.806  |
| Distribution of workers in agriculture (%)               | 46.781 | 8.958  | 44.146 | 9.322  |
| Distribution of workers in the industry (%)              | 13.325 | 3.847  | 15.988 | 4.152  |
| Distribution of workers in service (%)                   | 39.893 | 6.398  | 39.883 | 8.315  |
| Growth in the number of workers employed in agriculture  | 0.215  | 0.354  | 0.215  | 0.350  |
| Growth in the number of workers employed in the industry | 0.814  | 0.687  | 0.815  | 0.680  |
| Growth in the number of workers employed in service      | 0.109  | 0.161  | 0.109  | 0.159  |
| The ratio of workers who are male (%)                    | 63.806 | 3.335  | 63.908 | 3.662  |
| Growth in the number of male workers                     | 0.145  | 0.096  | 0.145  | 0.096  |
| The ratio of workers who are female (%)                  | 25.1   | 6.122  | 28.438 | 5.027  |
| Growth in the number of female workers                   | 0.319  | 0.463  | 0.319  | 0.459  |

### 3.4.2 Estimation Strategies

#### 3.4.2.1 Difference-in-Difference Method

The first method used in this essay—based on the Difference-in-Difference (DiD) strategy implemented by Balkan and Tumen (2016), Ceritoglu et al. (2017), and Tumen (2021)—involved comparing regions with the highest Syrian population to regions with almost no Syrians population before and after the cut-off year. Syrians started to arrive in Türkiye at the beginning of 2011, but until the end of 2012, the density of Syrians was close to zero. Thus, the pre-Syrian and post-Syrian time intervals are constituted around this cut-off date. At the same time, treatment and control areas were created by considering regional Syrian concentrations and economic, social, ethnic, cultural, religious, and historical characteristics as discussed in Tumen (2016) and Ceritoglu et al. (2017).<sup>20</sup> Taking into account all of these factors, two dummy variables  $T$  and  $R$  were constructed in line with the literature as follows:

$$T_{ry} = \begin{cases} 1, & \text{year} > 2012 \\ 0, & \text{year} \leq 2012 \end{cases} \quad \text{and} \quad R_{ry} = \begin{cases} 1, & \text{NUTS2 in treatment group} \\ 0, & \text{NUTS2 in control group} \end{cases}$$

where  $r$  and  $y$  indicate NUTS2-level region and years, respectively. Main treatment group included five NUTS2-level regions (TRC1, TR62, TR63, TRC2, TRC3), while the control group contained four NUTS2-level regions (TRA1, TRA2, TRB1, TRB2), respectively. This framework led to the following DiD formulas:

$$\log(JVR_{ry}) = \beta_1 + \beta_2(T_{ry} \cdot R_{ry}) + \beta_3 X_{ry} + f_r + f_y + \varepsilon_{ry}, \quad (3.8)$$

$$\log(JFR_{ry}) = \beta_1 + \beta_2(T_{ry} \cdot R_{ry}) + \beta_3 X_{ry} + f_r + f_y + \varepsilon_{ry} \quad (3.9)$$

where  $r$  and  $y$  are the index NUTS2-level regions, and years, respectively. The dependent variable is the logarithm of the JVR in equation (3.8) and JFR in equation (3.9),  $X$  is a vector of the NUTS2-level socioeconomic variables,  $\varepsilon$  is an error term, and  $f_i$  and  $f_j$  are the region and year-fixed effects, respectively. The main coefficient of interest is  $\beta_2$ , which renders the average change in JVR and JFR in the treatment area resulting from the influx of Syrians.

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<sup>20</sup> Syrians concentrations of the NUTS2-level regions are shown in Table A.1.

### 3.4.2.2 Synthetic Control Method

The Synthetic Control Method (SCM) which was first introduced by Abadie and Gardeazabal (2003) and then further improved by Abadie, Diamond, and Hainmuller (2010, 2015) was also utilized. The main goal of this econometric technique is to evaluate whether the intervention/treatment influences some consequences in the treated unit, pertaining to when it would not have occurred, and describe a control group called the Synthetic Control Unit. The SCM is explained by the non-intervention outcome for unit  $i$  at time  $t$ :

$$Y_{it}^N = \alpha_t + \beta_t X_i + \mu_t Z_i + \varepsilon_{it}$$

where  $\alpha_t$  is a common time-dependent factor,  $\beta_t$  is a vector of unknown parameters,  $X_i$  is a vector of observed covariates not affected by the intervention,  $\mu_t Z_i$  is a vector of unobserved time-specific common factors multiplied by a vector of unobserved unit-specific factor loadings, and  $\varepsilon_{it}$  is an unobserved temporary shock.  $\mu_t Z_i$  enables the impact of unobserved unit-specific confounders to vary over time. The unit of interest is identified as unit  $i=1$ , and a vector of weights is defined as  $S = (s_2, \dots, s_{k+1})'$  in which  $k$  represents non-treated units,  $s_k \geq 0$ , and  $s_2 + \dots + s_k = 1$ . A linear combination of non-treated units for any time  $\sum_{k=2}^{k+1} s_k Y_{kt}$  is created with the help of  $S$ , which also denotes synthetic control. This term is used as a counterfactual for the intervention unit. Significant analysis and discussion conducted within the scope of this framework indicate that an  $S^*$  that has similar characteristics with  $S$  can ensure an unbiased estimator of outcome in the absence of intervention  $Y_{1t}^N$ . In that case, a vector of observed covariates and a linear combination of pre-intervention outcomes are shown to be  $X_1 = \sum_{k=2}^{k+1} s_k^* X_k$  and  $\bar{Y}_1 = \sum_{k=2}^{k+1} s_k^* \bar{Y}_k$ , respectively (Abadie et al. 2010; Abadie et al. 2015; Abadie and Gardeazabal 2003). This method aims to minimize the distance between the estimated variables of the treated unit and the synthetic control unit with respect to  $S^*$ . Moreover, the weights put on the estimated variables are selected to minimize the mean square predictor error of the outcome variable for the pre-intervention periods.

This method has several advantages. First, it constructs a synthetic province, which substitutes for the control group and decreases the temporary nature of choosing the control group. Second, its quality is confirmed by controlling the pre-treatment differences of the dependent variable between the treated and the Synthetic Control Units. Finally, by creating a synthetic control for every unit (e.g., province) a

distribution of the observed effects can be obtained. Then a p-value for how significant the post-treatment difference is compared to the pre-treatment relative to the whole distribution can be calculated, thus conducting inference with idiosyncratic province-specific shocks.

To identify the causal effect of the Syrian shock, it is important to select the comparison areas properly so that they are representative of the treatment areas. For this reason, to facilitate a robustness assessment for the DiD approach, the synthetic control method was used. The SCM reproduces the counterfactual group for the treatment group in the absence of the Syrian influx and compares the alteration of the dependent variable in treated units after a Syrian shock with respect to the alteration of the same variable in a donor pool of untreated units. The main goal of this econometric technique is to overcome the problem of choosing the best comparison group, referred to as the ‘synthetic control unit’. A p-value for how significant the post-treatment (2013–2018) difference is when compared to the pre-treatment (2009–2012) relative to the whole distribution can be calculated, thus constructing an inference for idiosyncratic province-specific shocks.

Therefore, the essay relies on the synthetic control method (SCM) to construct a weighted combination of potential control units to be used as the counterfactual. Thus, the synthetic control uses the best possible arrangement of donor weights that reduce the gap between JVR or JFR in NUTS2-level regions where the Syrian populations are concentrated, and its synthetic control is as follows:

$$\min(JVR - \sum_{r=1}^m JVR_r W)^2 \text{ subject to } w_r > 0 \quad (3.10)$$

$$\min(JFR_{UK} - \sum_{c=1}^m JFR_c W)^2 \text{ subject to } w_c > 0 \quad (3.11)$$

where  $r$  represents the number of donor NUTS2-level regions and  $W$  is an  $(r \times 1)$  vector of non-negative weights (Abadie, Diamond, and Hainmueller 2010; Abadie and Gardeazabal 2003). Using that control group, equation (3.8) is estimated via weighted least squares. Standard errors are clustered at the NUTS2 regional level.

### 3.4.2.3 Instrumental Variable Approach

Syrians began arriving in Türkiye at the beginning of 2011; thus, until the end of 2012, the density of Syrians in Türkiye was close to zero. Between the end of 2012 and mid-2014, most of them inhabited the provinces bordering Syria, before beginning to move west after this period. Due to these shifts, one could expect to see long-term differences in labor market efficiency (Håkansson, and Tovatt, 2017). Therefore,

analysis for two time periods was performed: between the years 2009–2015 (short-term) and 2009–2018 (long-term) as in Tumen (2016, 2021).

As the DiD model suffers from the problem of selection bias (Borjas, 1987; Borjas et al., 1992) due to the endogeneity of the settlement patterns of Syrians—e.g., immigrants are more likely to prefer regions with high economic growth (Gurak and Kritz, 2000)—the Instrumental Variable Approach (IV) was employed to address this issue, similar to previous studies (e.g., Aksu et al., 2018; Del Carpio and Wagner, 2015). The following regression was estimated:

$$\log(JVR_{ry})_{pt} = \alpha + \gamma P_{pt} + f_t(D_p) + g(X_{pt}) + \delta_p + \delta_t + \varepsilon_{pt} \quad (3.12)$$

$$\log(JFR_{ry})_{pt} = \alpha + \gamma P_{pt} + f_t(D_p) + g(X_{pt}) + \delta_p + \delta_t + \varepsilon_{pt} \quad (3.13)$$

where  $p$  refers to the province in Türkiye and  $t$  refers to the year. The dependent variables are the job vacancy rate ( $\log(JVR_{ry})_{pt}$ ) and job-finding rate ( $\log(JFR_{ry})_{pt}$ ), and the primary variable of interest is the number of Syrians normalized by the population  $P$  of a region  $\gamma$ .  $D$  is the high-order polynomial of the inverse distance, and the covariates mentioned earlier are rendered in terms of  $X_{pt}$ .

The instrument substituted for the number of Syrians is the travel distance from the Syrian governorate from which each Syrian is fleeing to potential Turkish NUTS2 regional destinations. These resulted in 26 Turkish regions\*13 Syrian governorate pairs. The instrument was therefore calculated as follows:

$$IV_{pt} = \sum_s \frac{1}{T_{sp}} \theta_s P_t$$

where  $P_t$  is the total number of registered Syrians in Türkiye in year  $t$ ,  $\theta_s$  is the fraction of Syrians in 2013 from each Syrian governorate ( $s$ ), and  $T_{sp}$  is the distance between the province of Türkiye and the Syrian governorate.

## 3.5 Results

### 3.5.1 Difference-in-Difference Analysis Estimates

To begin with, it is essential to assess the common trend assumption, also referred to as the parallel path assumption, which forms the foundation for the validity of the Difference-in-Differences (DID) estimation. The parallel-trend test was conducted using the STATA command "didq" developed by Mora and Reggio (2015). This command calculates the test by considering the null hypothesis of parallel paths through auxiliary regressions, where year dummies interacted with the treatment dummy. If the test is rejected, it indicates a violation of the parallel path assumption.

The p-values for the common trends test are presented in Table 3.5. In the regressions, I fail to reject the null hypothesis of common trends, so observations have parallel paths.

Table 3.5: Testing Common Trends Assumption (p-values).

|                                                     | JVR    | JFR    |
|-----------------------------------------------------|--------|--------|
| Total                                               | 0.6023 | 0.2807 |
| Clerical Support Workers                            | 0.8537 | 0.3011 |
| Services and Sales Workers                          | 0.2765 | 0.8346 |
| Elementary Occupations                              | 0.1987 | 0.9405 |
| Skilled Agricultural, Forestry, and Fishery Workers | 0.9823 | 0.3465 |
| Professionals                                       | 0.7643 | 0.3257 |
| Craft and Related Trades Workers                    | 0.6464 | 0.8482 |
| Technicians and Associate Professionals             | 0.7122 | 0.666  |
| Plant and Machine Operators and Assemblers          | 0.4597 | 0.7579 |
| Managers                                            | 0.7299 | 0.9832 |

Source: Authors' calculations using a data set that comes from data that was used for the essay.

Table 3.6 displays the results from the difference-in-difference regressions estimated by equations 1 and 2. The top half of the table shows the findings in the time interval between 2009-2015. The first column shows that the job vacancy rate in the treatment area diminished by 6.8% compared to the control areas due to the Syrian inflows. On the one hand, since job vacancies measure the impact of friction in job matching on employment, the negative impact of a supply shock on job vacancies implies that there is more efficient job matching due to a reduced mismatch between labor demand and supply in the Turkish market. On the other hand, this finding also could imply that thanks to Syrians, firms are reducing their costs because they are expending less time and effort to recruit workers and fill vacant jobs. The second

column demonstrates that the job-finding rate for native individuals in the treatment area regions has declined by 9.1%, compared with individuals in control areas after the Syrian inflow, but not significant.<sup>21</sup>

The bottom half of the table demonstrates results in time intervals from 2009-2018. The first column shows that the job vacancy rate in the treatment area diminished by 10.6% compared to the control areas due to the Syrian inflows. The second column demonstrates that the job-finding rate for native individuals in the treatment area regions has declined by 18.2%, compared with individuals in control areas after the Syrian inflow.<sup>22</sup> This indicates that the Beveridge curve shifted inwards due to the inflow of Syrians between 2009 and 2018; in other words, they raised job-matching efficiency and improved labor market conditions by reducing the number of unfilled vacancies and job seekers for the given unemployment rate in the Turkish labor market.

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<sup>21</sup> Same analysis was also performed for the cut-off year 2011 as discussed in Ceritoglu et al. (2017) and similar results were attained.

<sup>22</sup> Same analysis was also performed for the cut-off year 2011 as discussed in Ceritoglu et al. (2017) and similar results were attained.

Table 3.6: The Impact of Syrian Influx on Job Vacancy Rate and Job Finding Rate (DiD).

|                                | Period of Observation: 2009-2015 |                     |
|--------------------------------|----------------------------------|---------------------|
|                                | Log JVR                          | Log JFR             |
| Syrian effect ( $R \times T$ ) | -0.068**<br>(0.029)              | -0.091<br>(0.066)   |
| Intercept                      | 22.895*<br>(10.107)              | 8.492<br>(20.150)   |
| R <sup>2</sup>                 | 0.881                            | 0.973               |
| Observation                    | 63                               | 63                  |
|                                | Period of Observation: 2009-2018 |                     |
|                                | Log JVR                          | Log JFR             |
| Syrian effect ( $R \times T$ ) | -0.106**<br>(0.036)              | -0.182**<br>(0.056) |
| Intercept                      | 26.992**<br>(10.081)             | 26.441*<br>(13.349) |
| R <sup>2</sup>                 | 0.866                            | 0.972               |
| Observation                    | 90                               | 90                  |
| Year fixed effects             | Yes                              | Yes                 |
| Region fixed effects           | Yes                              | Yes                 |
| Other controls                 | Yes                              | Yes                 |

Note: Robust standard errors presented in parentheses are clustered at the regional level. The data consist of yearly observations for each NUTS2-level region between 2009 and 2018. All regressions include vectors of the NUTS2-level region and year-fixed effects. The table documents the interaction coefficients between a dummy variable indicating the NUTS2-level regions and the timing of the post-Syrian period (the baseline time interval is between 2012–2018).

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Even though total labor supply and demand are equal, supply or demand surpluses occur in low-end markets due to wage rigidity resulting from the stratified nature of the labor market. Consequently, some unemployment and vacant jobs may continue to exist even in a strong economy, since the skills of unemployed individuals may not exactly match the requirements of vacant jobs in certain sub-occupations (Dow and Dicks-Mireaux, 1958; Holt and David, 1966). Additionally, even when the overall effect of Syrians is negative, some sub-occupations may face different consequences of Syrians, both due to job requirements and the characteristics of Syrians and natives employed in these jobs. For this reason, the magnitude of efficiency in the job matching process varies according to the characteristics of occupations (e.g., whether labor-intensive or technology-intensive) and demographic composition of occupations (e.g., whether male- or female-dominated, education level,

age structure, etc.). Therefore, the effects of the Syrian influx on JVR and JFR were investigated by considering nine occupation groups.

The results presented in Table 3.7 show the impact of the rapid and unexpected influx of Syrians on JVR according to occupation groups. Both in the short term and the long term, it is seen that the Syrian immigrants induce a reduction in the JVR of the natives. Except for three sub-occupation groups including skilled agricultural, forestry, and fishery, technicians, and associate professionals and managers, long-run effects are higher than short-run for most of the sub-occupation groups. Because, with the migration of Syrians from rural to urban after mid-2014, they may have been employed informally in occupations with a high demand for labor in these occupations, thus reducing the number of vacant jobs. As is expected, natives working in skilled agricultural, forestry, and fishery occupations face the highest decrease in JVR in the short and long run, because it is known that Syrians can be granted a work permit by the provincial governorates if they want to work as a seasonal agricultural and livestock worker. However, it is seen that there is a considerable decrease in this coefficient after migration to the West. With regard to changes in the magnitude of other coefficients, JVR in the treatment area increased from 10.7% to 13.5% for services and sales workers; from 7.4% to 11.4% for elementary occupations; from 9.3% to 10.8% for professionals; from 6.5% to 6.9% for plant and machine operators and assemblers compared to the control areas. It is noticed that while JVR in craft and related trades do not affect the massive inflow of Syrians in both the short and long run, the nonsignificant short-run coefficient of Clerical Support occupation becomes significant in the long run. In general, the findings in Table 3.7 illustrate that the highest significant negative effect was found in the labor-intensive, low-educated, and low-skill jobs in the agriculture, construction, manufacturing, and service occupations owing to the share of working Syrians (Erdogan, 2017; Erdogan and Unver, 2015), they might fill open vacancies in these areas.

Table 3.7: The Impact of Syrian Influx on Job Vacancy Rate, by Occupations (DiD).

| Variable                         | Clerical<br>Support<br>Workers | Services<br>and Sales<br>Workers | Elementary<br>Occupations | Skilled<br>Agricultural,<br>Forestry and<br>Fishery<br>Workers | Professionals        | Craft<br>and<br>Related<br>Trades<br>Workers | Technicians<br>and<br>Associate<br>Professionals | Plant and<br>Machine<br>Operators<br>and<br>Assemblers | Managers            |
|----------------------------------|--------------------------------|----------------------------------|---------------------------|----------------------------------------------------------------|----------------------|----------------------------------------------|--------------------------------------------------|--------------------------------------------------------|---------------------|
| Period of Observation: 2009-2015 |                                |                                  |                           |                                                                |                      |                                              |                                                  |                                                        |                     |
| Syrian effect (R × T)            | 0.007<br>(0.038)               | -0.107**<br>(0.035)              | -0.074**<br>(0.023)       | -0.505**<br>(0.185)                                            | -0.093**<br>(0.035)  | -0.011<br>(0.045)                            | -0.140***<br>(0.031)                             | -0.065*<br>(0.031)                                     | -0.205**<br>(0.084) |
| Intercept                        | 32.391<br>(18.650)             | 65.303**<br>(21.647)             | 11.110<br>(12.717)        | 8.445<br>(55.154)                                              | 7.871<br>(30.694)    | 19.701<br>(22.156)                           | 7.448<br>(19.510)                                | 48.576***<br>(13.995)                                  | 83.957<br>(51.067)  |
| R <sup>2</sup>                   | 0.757                          | 0.769                            | 0.808                     | 0.441                                                          | 0.735                | 0.873                                        | 0.722                                            | 0.837                                                  | 0.438               |
| Observation                      | 63                             | 63                               | 63                        | 59                                                             | 63                   | 63                                           | 63                                               | 63                                                     | 62                  |
| Period of Observation: 2009-2018 |                                |                                  |                           |                                                                |                      |                                              |                                                  |                                                        |                     |
| Syrian effect (R × T)            | -0.056**<br>(0.021)            | -0.135***<br>(0.040)             | -0.114***<br>(0.034)      | -0.389***<br>(0.114)                                           | -0.108***<br>(0.031) | -0.048<br>(0.039)                            | -0.132***<br>(0.031)                             | -0.069**<br>(0.026)                                    | -0.194**<br>(0.074) |
| Intercept                        | 29.768<br>(17.904)             | 72.578***<br>(19.425)            | 26.433*<br>(11.692)       | -15.916<br>(41.018)                                            | 18.019<br>(22.597)   | 13.301<br>(17.077)                           | 11.512<br>(18.337)                               | 48.415**<br>(14.891)                                   | 82.437<br>(46.801)  |
| R <sup>2</sup>                   | 0.685                          | 0.743                            | 0.804                     | 0.357                                                          | 0.765                | 0.835                                        | 0.714                                            | 0.854                                                  | 0.577               |
| Observation                      | 90                             | 90                               | 90                        | 86                                                             | 90                   | 90                                           | 90                                               | 90                                                     | 89                  |
| <b>Fixed Effects</b>             |                                |                                  |                           |                                                                |                      |                                              |                                                  |                                                        |                     |
| Year fixed effects               | Yes                            | Yes                              | Yes                       | Yes                                                            | Yes                  | Yes                                          | Yes                                              | Yes                                                    | Yes                 |
| Region fixed effects             | Yes                            | Yes                              | Yes                       | Yes                                                            | Yes                  | Yes                                          | Yes                                              | Yes                                                    | Yes                 |
| Other controls                   | Yes                            | Yes                              | Yes                       | Yes                                                            | Yes                  | Yes                                          | Yes                                              | Yes                                                    | Yes                 |

Note: Robust standard errors presented in parentheses are clustered at the regional level. The data consist of yearly observations for each NUTS2-level region between 2009 and 2018. All regressions include vectors of NUTS2-level region and year-fixed effects. The table documents the interaction coefficients between a dummy variable indicating the NUTS2-level regions and the timing of the post-Syrian period (the baseline time interval is between 2012-2018).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Results point out that the rapid and unexpected influx of Syrians alleviated JFR in most of these occupation groups in both the short and long run. This means that the Syrian inflow has made finding jobs difficult for natives in the treatment areas compared to those in the control areas for most occupation groups. In Table 3.8, the findings in the short run indicate that Syrians have significantly decreased JFR in treatment areas by 53% for skilled agricultural, forestry, and fishery workers; 23.2% for managers; and 17.4% for technicians and associate professionals compared to control areas. For other occupations, the decline is less significant: 13.5% for services and sales workers, 16.2% for professionals, 11.2% for elementary occupations, and 11.5% for clerical support workers. Regarding findings on long-run analysis, except for Skilled Agricultural, Forestry, and Fishery occupations, the magnitude of coefficients and the level of significance of JFR in occupations has increased compared to short-term results. Change in JFR, in the long run, is highest for natives working in Clerical Support occupations (from %2.9 to %11.6) compared to the short term. Nevertheless, Syrians in the treatment region highly decrease in Skilled Agricultural, Forestry, and Fishery workers JFR (45.9%) compared to the natives in the control region. These findings empirically document an inward shift of the Beveridge curve in the wake of the massive Syrian influx from 2009–to 2018 and imply increasing matching efficiency between labor demand and labor supply in these occupation groups. These results confirmed the expectations since Syrians have lower skill levels than natives and typically do not possess work permits; thus, they must engage in manual or non-skilled jobs in the informal economy, thereby filling unskilled positions (e.g., Del Carpio and Wagner, 2015; Tumen, 2016; Ceritoglu et al., 2017; Aksu et al., 2018; Altindag et al., 2020).

Table 3.8: The Impact of Syrian Influx on Job Finding Rate, by Occupations (DiD).

| Variable                         | Clerical<br>Support<br>Workers | Services<br>and Sales<br>Workers | Elementary<br>Occupations | Skilled<br>Agricultural,<br>Forestry, and<br>Fishery<br>Workers | Professionals       | Craft and<br>Related<br>Trades<br>Workers | Technicians<br>and Associate<br>Professionals | Plant and<br>Machine<br>Operators<br>and<br>Assemblers | Managers            |
|----------------------------------|--------------------------------|----------------------------------|---------------------------|-----------------------------------------------------------------|---------------------|-------------------------------------------|-----------------------------------------------|--------------------------------------------------------|---------------------|
| Period of Observation: 2009-2015 |                                |                                  |                           |                                                                 |                     |                                           |                                               |                                                        |                     |
| Syrian effect (R × T)            | -0.029<br>(0.054)              | -0.135*<br>(0.066)               | -0.112*<br>(0.050)        | -0.530**<br>(0.193)                                             | -0.116*<br>(0.060)  | -0.035<br>(0.066)                         | -0.174**<br>(0.053)                           | -0.091<br>(0.056)                                      | -0.232**<br>(0.100) |
| Intercept                        | 20.287<br>(24.228)             | 49.324<br>(29.948)               | 0.177<br>(21.720)         | -20.399<br>(59.175)                                             | -4.670<br>(44.631)  | 2.894<br>(33.831)                         | -2.221<br>(30.551)                            | 35.428<br>(26.441)                                     | 73.257<br>(50.408)  |
| R <sup>2</sup>                   | 0.965                          | 0.973                            | 0.969                     | 0.753                                                           | 0.956               | 0.971                                     | 0.969                                         | 0.971                                                  | 0.913               |
| Observation                      | 63                             | 63                               | 63                        | 59                                                              | 63                  | 63                                        | 63                                            | 63                                                     | 62                  |
| Period of Observation: 2009-2018 |                                |                                  |                           |                                                                 |                     |                                           |                                               |                                                        |                     |
| Syrian effect (R × T)            | -0.116**<br>(0.038)            | -0.194***<br>(0.054)             | -0.196***<br>(0.055)      | -0.459***<br>(0.122)                                            | -0.170**<br>(0.051) | -0.109<br>(0.063)                         | -0.201***<br>(0.054)                          | -0.127**<br>(0.047)                                    | -0.254**<br>(0.083) |
| Intercept                        | 25.622<br>(19.809)             | 69.643***<br>(16.917)            | 31.458*<br>(15.997)       | -30.196<br>(41.327)                                             | 13.426<br>(33.652)  | 9.391<br>(24.255)                         | 9.246<br>(26.676)                             | 43.300*<br>(21.158)                                    | 81.453*<br>(36.999) |
| R <sup>2</sup>                   | 0.963                          | 0.968                            | 0.964                     | 0.800                                                           | 0.961               | 0.967                                     | 0.969                                         | 0.974                                                  | 0.924               |
| Observation                      | 90                             | 90                               | 90                        | 86                                                              | 90                  | 90                                        | 90                                            | 97                                                     | 89                  |
| <b>Fixed Effects</b>             |                                |                                  |                           |                                                                 |                     |                                           |                                               |                                                        |                     |
| Year fixed effects               | Yes                            | Yes                              | Yes                       | Yes                                                             | Yes                 | Yes                                       | Yes                                           | Yes                                                    | Yes                 |
| Region fixed effects             | Yes                            | Yes                              | Yes                       | Yes                                                             | Yes                 | Yes                                       | Yes                                           | Yes                                                    | Yes                 |
| Other controls                   | Yes                            | Yes                              | Yes                       | Yes                                                             | Yes                 | Yes                                       | Yes                                           | Yes                                                    | Yes                 |

Note: Robust standard errors presented in parentheses are clustered at the regional level. The data consist of yearly observations for each NUTS2-level region between 2009 and 2018. All regressions include vectors of NUTS2-level region and year-fixed effects. The table documents the interaction coefficients between a dummy variable indicating the NUTS2-level regions and the timing of the post-Syrian period (the baseline time interval is between 2012-2018).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 3.6 Robustness Checks

### 3.6.1 Results of the Synthetic Control Method Estimates

This section discusses the findings obtained from the SCM for the Job Vacancy rate and Job Finding Rate of the data from 2009 to 2018.<sup>23</sup> The SCM was conducted for the four NUTS2-level regions that include the provinces with the highest immigrant-to-native population ratio: TRC1, TR63, TRC2, and TRC3.<sup>24</sup> After conducting this preliminary SCM, the treatment to the regions that were least affected by the migration wave from Syria was reassigned. Thus, synthetic counterfactuals were constructed, creating a donor pool from up to 21 NUTS2-level regions.<sup>25</sup> Subsequently, the difference between each actual region and their synthetic counterparts was computed, before plotting all these difference-time series together to identify whether these cities stood out.

Figure 3.8 and Figure 3.9 shows the trends in the JVR and JFR for these four regions separately, along with those of their synthetic counterparts. The synthetic control regions did not follow these four regions after the influx of Syrians in 2013; that is, the two lines diverged after the cut-off year. Figure 3.8 depicts that the influx of Syrians into these regions significantly altered the trends in the JVR when compared to the synthetic control. In particular, the SCM had a good fit in the pre-treatment period in the TR63 region, since, graphically, the two lines overlap before 2013 and the value of the root mean square prediction error (RMSPE) is equal to 0.017. The RMSPE shows the root of the average of the squared discrepancies between the JVR in regions and those of their synthetic counterparts during 2009–2018 (Abadie et al., 2010). The RMSPEs of the other regions are 0.019 for TRC1, 0.038 for TRC2, and 0.019 for TRC3, respectively. The control regions (weights) generating the synthetic control are TR41 (0.101), TR42 (0.311), TR81 (0.201), TRB2 (0.386) for TR63; TR22 (0.176), TR41 (0.123), TR71 (0.106), TRA2 (0.16), TRB1 (0.435) for TRC1; TR41 (0.122), TR42 (0.118), TR51 (0.092), TR61 (0.107), TR71 (0.076), TRA2 (0.485) for TRC2; TR51 (0.12), TRA2 (0.88) for TRC3.

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<sup>23</sup> Same analysis was performed for short-term and the results are consistent with the DiD method results.

<sup>24</sup> For more detailed description of the NUTS2-level regional division in Türkiye, see Table 3.1.

<sup>25</sup> There are 26 total regions, but five regions that used in the main treatment analysis was excluded due to the definition of the SCM procedure.

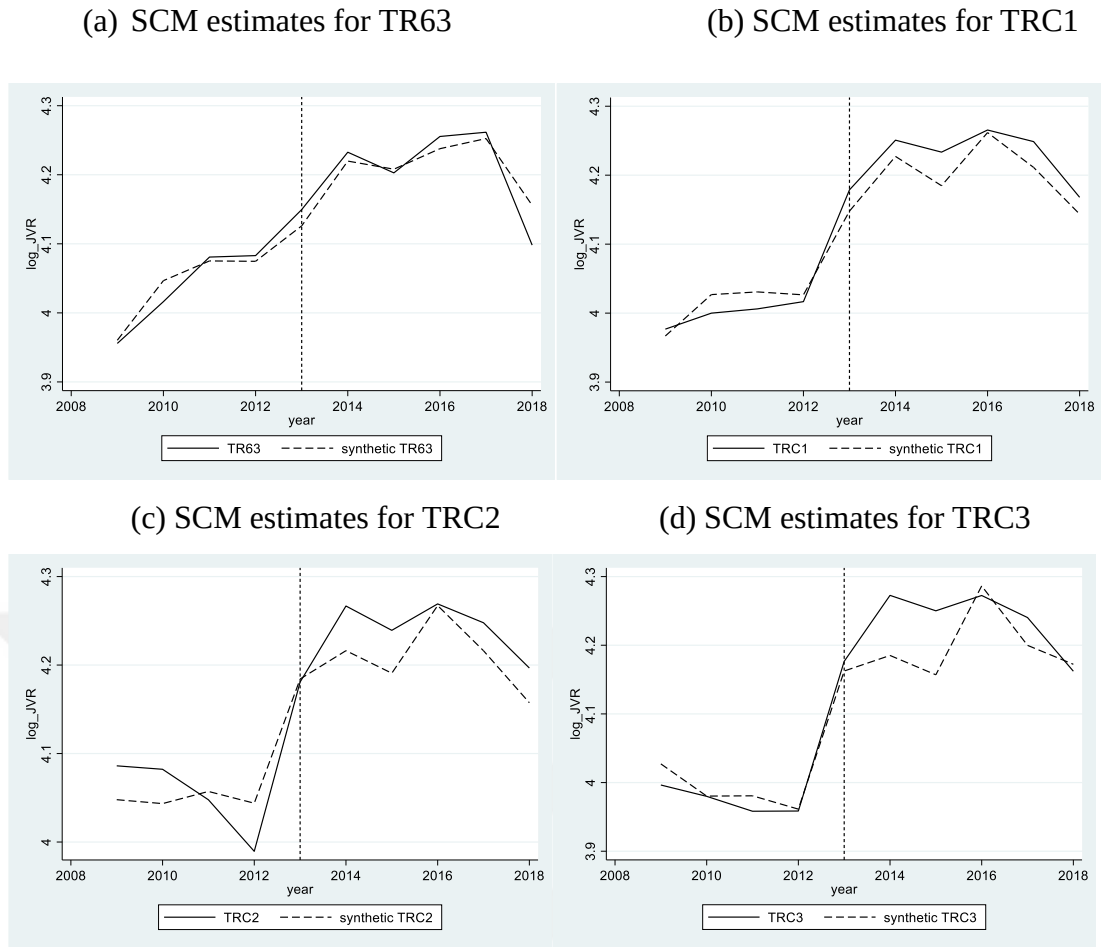


Figure 3.8: Synthetic Control Event Study Estimates for Job Vacancy Rate (2009–2018).

Table 3.9 shows the t-test results for the Job Vacancy Rate to compare the estimates of the synthetic controls with the actual values for the pre-Syrian and post-Syrian periods, separately. These t-tests suggest that the standard statistical test results could not reject the null hypothesis of parallel trends.

Table 3.9: Synthetic Control Method t-test Results for Job Vacancy Rate (2009–2018).

| The logarithm of the<br>Job Vacancy Rate | Pre-Syrian<br>t statistic | Post-Syrian<br>t statistic |
|------------------------------------------|---------------------------|----------------------------|
| TR63                                     | -0.130                    | 0.001                      |
| TRC1                                     | -0.733                    | 1.115                      |
| TRC2                                     | 0.146                     | 1.309                      |
| TRC3                                     | -0.838                    | 1.270                      |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Regarding the JFR results, Figure 3.9 illustrates that the influx of Syrians into these regions significantly altered the trends in the JFR when compared to the synthetic

control. In particular, the SCM had a good fit in the pre-treatment period in the TR63 region, since, graphically, the two lines overlap before 2013 and the value of the root mean square prediction error (RMSPE) is equal to 0.005. The RMSPEs of the other regions were 0.171 for TRC1, 0.066 for TRC2, and 0.356 for TRC3, respectively. The control regions (weights) generating the synthetic control are TR22 (0.008), TR31 (0.236), TR81 (0.008), TRB1 (0.374), and TRB2 (0.373) for TR63. Similarly, the control regions (weights) generating the synthetic control were TR31 (0.416), TR42 (0.199), TR71 (0.131), TRB2 (0.254) for TRC1; TR41 (0.567), TRB2 (0.433), for TRC2; TR31 (0.788), and TRA2 (0.212) for TRC3.

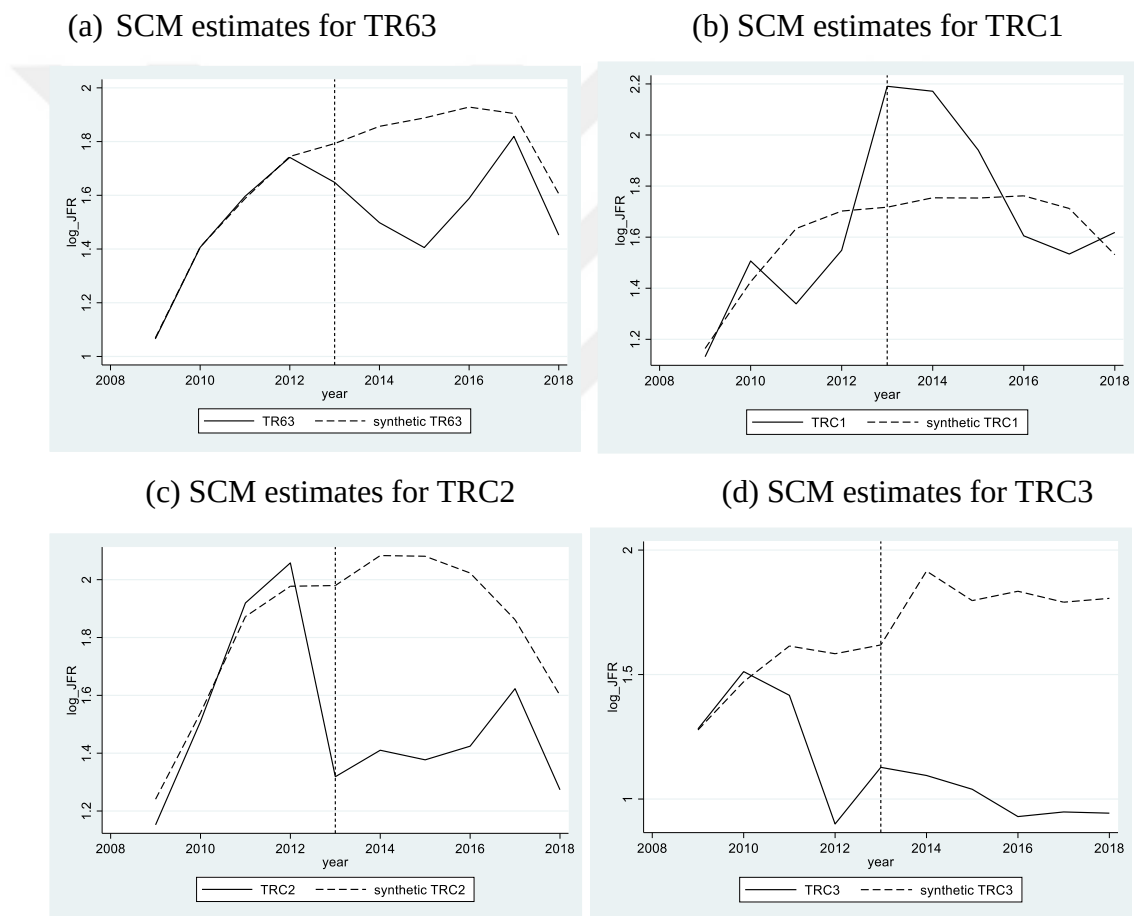


Figure 3.9: Synthetic Control Event Study Estimates for Job Finding Rate (2009–2018).

Table 3.10 shows the t-test results for the Job Finding Rate to compare the estimates of the synthetic controls with the actual values for the pre-Syrian and post-Syrian periods, separately. Except for TRC1, these t-tests suggest that the standard statistical test results could reject the null hypothesis of parallel trends. For instance, the t-values of the difference between the JFR in TR63 and the estimates from the

synthetic regions are 0.0006 and -3.312 in the pre-Syrian period and post-Syrian period, respectively. This means that the synthetic region is a good control group because while the effect of the influx of Syrians on the JFR is not significant before the pre-Syrian period, it turns significant after the post-Syrian period. The same is also true for TRC2 and TRC3 within those regions. This supports the essay's main findings, which indicate that an increase in the rate of Syrians has a statistically negative significant effect on the host country's JFR.

Table 3.10: Synthetic Control Method t-test Results for Job Finding Rate (2009–2018).

| The logarithm of the Job Vacancy Rate | Pre-Syrian statistic | Post-Syrian t statistic |
|---------------------------------------|----------------------|-------------------------|
| TR63                                  | 0.0006               | -3.312***               |
| TRC1                                  | -0.649               | 1.095                   |
| TRC2                                  | 0.008                | -5.912***               |
| TRC3                                  | -1.353               | -14.770***              |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

### 3.6.2 Instrumental Variable Approach Estimates

Table 3.11 and Table 3.12 report the effect of Syrians on labor market efficiency in Türkiye during the short-term (2009–2015) and long-term (2009–2018) periods, respectively. The first column shows the job vacancies and findings from the whole sample, while the other columns present findings across different occupations. The first and second panels present the job vacancy rate and job finding rate estimates, respectively. For the sake of comparing the OLS and IV approaches, each panel also provides findings obtained from these methods.

The OLS results presented in the first panel of Table 3.11 show that in no case is the coefficient of the job vacancy rate statistically different from zero in the short term, but the signs of these coefficients are negative as expected. Thus,  $H_1$  and  $H_2$  were rejected—that is, Syrians did not cause a decrease in the job vacancy rate in either the whole sample or across occupations in Türkiye. However, OLS cannot tackle the endogeneity problem that arises from the fact that Syrians can choose the place in which they settle, hence such an analysis may provide spurious results. Therefore,

Equations 3.12 and 3.13 was estimated using the IV approach to solve the endogeneity concerns related to OLS and to compute coefficients more accurately.

Before proceeding to the IV results, it is necessary to mention some test statistic outcomes. Based on the findings of Staiger and Stock (1997), the assumption that an instrument is considered valid if its F-statistic, which measures the strength of the instrument, exceeds 10 was adopted. The analysis reveals that the F-statistics for all the samples examined are higher than 10, indicating that the instrument is highly valid based on the first-stage statistics results. Furthermore, the endogeneity test statistic reveals that the essay's variables are affected by endogeneity. Consequently, it is imperative to employ instrumental variable (IV) techniques to ensure the attainment of reliable and unbiased estimates.

The estimates obtained from the IV approach indicate that the massive influx of Syrians has a significant negative effect on the job vacancy rate for services and sales occupations, craft and related trade occupations, and managerial occupations. This result implies that since job vacancies measure the impact of friction in job matching on employment, the negative impact of a supply shock on job vacancies shows that there is more efficient job matching due to a reduced mismatch between labor demand and supply in these occupations. This finding could also indicate Syrians have enabled firms to reduce their costs since they are expending less time and effort to recruit workers and fill vacant jobs. Another remarkable result is that Syrians have increased job vacancy rates in skilled agricultural, forestry, and fishery occupations. Similar to the Panel 1 OLS estimates, the impact of Syrians on the job-finding rate in Panel 2 of Table 3.11 is negative, although not significant in all specifications. Regarding IV results in the short term, Syrians have also caused an increase in the job-finding rates for skilled agricultural, forestry, and fishery occupations. This result indicates that Syrians cause an outward shift in the Beveridge Curve for these occupations—that is since the increase in job vacancies is larger than the decrease in the unemployment rate, an outward shift has occurred. The labor market may have tightened to an exceptional degree since unemployment no longer decreased in line with the growth in the supply of openings. In other words, Syrians increased job matching inefficiency and exacerbated labor market conditions by augmenting the number of unfilled vacancies and job seekers for the given unemployment rate in these occupations. However, there is a negative causal relationship between services and sales occupations, technicians and associate professionals, and managers and the Syrian

population in certain regions. During the period under consideration, the unemployment rate was also inversely correlated to the job vacancy rate, suggesting an inward shift of the Beveridge Curve for these sectors implying that the inflow of Syrians leads to efficiency in the labor market in these occupations by shifting the Beveridge Curve inwards. Strikingly, while managers show significant inward shifts, the shifts in services and sales occupations, technicians, and associate professionals are less pronounced. Another important inference is that the signs of the OLS coefficients mostly coincide with the IV results, but the OLS estimates are considerably smaller and prove insignificant. Considering that the IV approach gives more accurate results, it can be misleading to interpret only the findings obtained from the OLS method.

The OLS estimates in the first panel of Table 3.12 are statistically indistinguishable from zero in the long term, but the effect of Syrians on the JVR for select occupations—namely clerical support, plant and machine operators, and assemblers, and managers—became positive. According to these results,  $H_1$  and  $H_2$  were rejected—that is, Syrian Syrians do not induce a decline in the job vacancy rate both in the whole sample and across occupations in Türkiye. However, as OLS cannot solve the endogeneity problem, the coefficients are not reliable, and hence Equations 3 and 4 were re-estimated through the IV approach. The results presented in the same panel propound that the Syrian influx does not affect the job vacancy rate in the long term, except for in the skilled agricultural, forestry, and fishery occupations, as well as the craft and related trades occupations. The coefficient of the first occupation, 0.140, indicates that a one percentage point increase in the Syrian-to-population ratio, in turn, raises skilled agricultural, forestry, and fishery workers' JVR by 0.140 standard deviations. In contrast, a one percentage point increase in the Syrian-to-population ratio reduces the JVR in craft and related trades occupations by 0.049 standard deviations. Furthermore, the OLS estimates of the job finding rates presented in the second panel of Table 3.12 suggest that only the JFR for craft and related trades occupations is significantly negatively correlated with the ratio of Syrians in the population. On the other hand, the IV estimates assert that the Beveridge Curve shifted inwards due to the inflow of Syrians between 2009 and 2018. Except for three fields: clerical support, plant and machine operators, and assemblers, and managers, Syrians raised job matching efficiency and improved Labor market conditions because unfilled job vacancies were reduced, and the unemployment rate was inversely correlated to

the job vacancy rate. While the craft and related trades Beveridge Curve demonstrate the highest inward shift, the curve's inward movement for the technicians and associate professionals, elementary occupations, professionals, and services and sales occupations are lower. On the other hand, Syrians shifted the Beveridge Curve outward in the skilled agricultural, forestry, and fishery occupations, thereby leading to inefficiency in these fields. As the increase in job vacancies is larger than the decrease in the unemployment rate, an outward shift has occurred. Lastly, the signs of the OLS estimate generally coincide with the IV results, but the OLS results are substantially smaller and insignificant. Note that interpreting only the coefficients of the OLS technique can be misleading and lead to inaccurate implications.

The coefficients can also provide evidence of how Syrians affect the Beveridge Curve in the short and long term. In the whole sample, the inflow of Syrians does not influence the Beveridge Curve in the short term, but they shift the curve inward and cause efficiency in the Turkish labor market in the long term. There is a key difference between the short- and long-term JVR coefficients obtained from the IV method. In the long term, Syrians have caused a greater decline in the JVR of the skilled agricultural, forestry, and fishery occupations than in the short term, whereas, in the short term, they led to a greater decrease in the JVR of craft and related trade occupations than in the long term. On the other hand, Syrians reduced the JVR of services and sales occupations and managers in the short term and the effect was significant, while the sign remained the same in the long term, but the significance disappear.

Moreover, the findings obtained from the IV method show that the effect of Syrians on the Beveridge Curve is different in the short term versus the long term. In the short term, the curve for the services and sales professions, as well as for the technicians and associate professionals' domain, shifted more inward than in the long term. In other words, in the short term, Syrians caused greater efficiency in these occupation groups than in the long term. Furthermore, while Syrians do not affect the Beveridge Curve in the elementary occupations, professionals, and craft and related trade occupations in the short term, the curve for these fields shifted inwards in the long term—that is, it created greater effectiveness in these occupations. On the contrary, while Syrians shifted the curve inward for managerial professions in the short term (causing efficiency), this effect disappeared in the long term. In addition, while Syrians did not affect the curve in skilled agricultural, forestry, and fishery occupations

in the short term, they shifted the curve outward in these occupation groups and caused inefficiency in the long term.



Table 3.11: The Impact of Syrian Influx on Labour Market Efficiency (IV, 2009-2015).

| Variable                    | Pooled Sample     | Clerical Support Workers | Services and Sales Workers | Elementary Occupations | Skilled Agricultural, Forestry and Fishery Workers | Professionals     | Craft and Related Trades Workers | Technicians and Associate Professionals | Plant and Machine Operators and Assemblers | Managers             |
|-----------------------------|-------------------|--------------------------|----------------------------|------------------------|----------------------------------------------------|-------------------|----------------------------------|-----------------------------------------|--------------------------------------------|----------------------|
| <b>OLS</b>                  |                   |                          |                            |                        |                                                    |                   |                                  |                                         |                                            |                      |
| log JVR                     | -0.020<br>(0.014) | -0.018<br>(0.042)        | -0.024<br>(0.026)          | -0.019<br>(0.025)      | -0.010<br>(0.130)                                  | -0.006<br>(0.035) | -0.028<br>(0.031)                | -0.020<br>(0.033)                       | -0.005<br>(0.032)                          | -0.049<br>(0.060)    |
| Unemployment Rate           | 0.005<br>(0.005)  | 0.012<br>(0.013)         | -0.003<br>(0.005)          | 0.004<br>(0.007)       | 0.018<br>(0.025)                                   | -0.005<br>(0.007) | 0.003<br>(0.010)                 | 0.005<br>(0.010)                        | 0.001<br>(0.010)                           | 0.014<br>(0.013)     |
| <b>IV</b>                   |                   |                          |                            |                        |                                                    |                   |                                  |                                         |                                            |                      |
| log JVR                     | -0.017<br>(0.019) | -0.028<br>(0.047)        | -0.053**<br>(0.021)        | 0.008<br>(0.039)       | 0.137*<br>(0.081)                                  | -0.020<br>(0.025) | -0.064**<br>(0.032)              | -0.044<br>(0.033)                       | 0.032<br>(0.029)                           | -0.144***<br>(0.040) |
| Unemployment Rate           | 0.002<br>(0.004)  | 0.004<br>(0.009)         | -0.000<br>(0.005)          | 0.001<br>(0.009)       | 0.005<br>(0.027)                                   | -0.005<br>(0.006) | 0.001<br>(0.007)                 | 0.004<br>(0.006)                        | -0.007<br>(0.007)                          | 0.021*<br>(0.011)    |
| F statistics                | 13.25             | 12.15                    | 11.18                      | 13.41                  | 13.18                                              | 11.25             | 12.55                            | 13.71                                   | 12.24                                      | 13.32                |
| Endogeneity Test-Statistics | 0.170**           | 0.117**                  | 0.3894***                  | 2.431**                | 3.935***                                           | 0.007*            | 5.141**                          | 1.359***                                | 1.976***                                   | 9.024*               |

Table 3.11: The Impact of Syrian Influx on Labour Market Efficiency (IV, 2009-2015) (Continued).

|                             |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <b>OLS</b>                  |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
| log JFR                     | -0.024<br>(0.023)    | -0.023<br>(0.037)    | -0.029<br>(0.034)    | -0.024<br>(0.033)    | -0.015<br>(0.112)    | -0.011<br>(0.031)    | -0.033<br>(0.041)    | -0.025<br>(0.026)    | -0.009<br>(0.038)    | -0.053<br>(0.072)    |
| Unemployment Rate           | -0.111***<br>(0.013) | -0.104***<br>(0.018) | -0.119***<br>(0.013) | -0.112***<br>(0.016) | -0.098***<br>(0.022) | -0.121***<br>(0.016) | -0.113***<br>(0.012) | -0.111***<br>(0.013) | -0.114***<br>(0.013) | -0.101***<br>(0.019) |
| <b>IV</b>                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
| log JFR                     | -0.027<br>(0.029)    | -0.036<br>(0.037)    | -0.056*<br>(0.032)   | 0.008<br>(0.061)     | 0.136**<br>(0.066)   | -0.027<br>(0.024)    | -0.064<br>(0.042)    | -0.068**<br>(0.030)  | 0.024<br>(0.052)     | -0.145***<br>(0.049) |
| Unemployment Rate           | -0.111***<br>(0.009) | -0.107***<br>(0.012) | -0.113***<br>(0.008) | -0.111***<br>(0.015) | -0.106***<br>(0.025) | -0.117***<br>(0.012) | -0.112***<br>(0.009) | -0.107***<br>(0.008) | -0.121***<br>(0.009) | -0.091***<br>(0.015) |
| F statistics                | 14.12                | 11.13                | 10.02                | 12.24                | 11.18                | 10.05                | 13.65                | 11.80                | 11.24                | 12.62                |
| Endogeneity Test-Statistics | 0.175***             | 0.060***             | 0.064**              | 2.739**              | 4.904***             | 0.178*               | 1.521**              | 0.566**              | 2.206***             | 4.203**              |
| <b>Fixed Effects</b>        |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
| Year fixed effects          | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  |
| Region fixed                | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  |
| Other controls              | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  | Yes                  |

Robust standard errors presented in parentheses are clustered at the regional level. The data consist of yearly observations for each NUTS2-level region between 2009–2015. The number of observations is 156 in all regression models, and they include vectors of the NUTS2-level region and year-fixed effects.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.12: The Impact of Syrian Influx on Labour Market Efficiency (IV, 2009-2018).

| Variable                    | Pooled Sample        | Clerical Support Workers | Services and Sales Workers | Elementary Occupations | Skilled Agricultural, Forestry and Fishery Workers | Professionals        | Craft and Related Trades Workers | Technicians and Associate Professionals | Plant and Machine Operators and Assemblers | Managers             |
|-----------------------------|----------------------|--------------------------|----------------------------|------------------------|----------------------------------------------------|----------------------|----------------------------------|-----------------------------------------|--------------------------------------------|----------------------|
| <b>OLS</b>                  |                      |                          |                            |                        |                                                    |                      |                                  |                                         |                                            |                      |
| log JVR                     | -0.005<br>(0.014)    | 0.017<br>(0.021)         | -0.008<br>(0.013)          | -0.018<br>(0.023)      | 0.070<br>(0.077)                                   | -0.002<br>(0.014)    | -0.025<br>(0.019)                | -0.010<br>(0.019)                       | 0.027<br>(0.024)                           | 0.004<br>(0.035)     |
| Unemployment Rate           | 0.002<br>(0.002)     | -0.000<br>(0.006)        | -0.003<br>(0.003)          | 0.007***<br>(0.003)    | -0.000<br>(0.008)                                  | -0.001<br>(0.003)    | -0.002<br>(0.003)                | -0.002<br>(0.004)                       | -0.006**<br>(0.003)                        | 0.006<br>(0.004)     |
| <b>IV</b>                   |                      |                          |                            |                        |                                                    |                      |                                  |                                         |                                            |                      |
| log JVR                     | 0.0002<br>(0.014)    | 0.015<br>(0.018)         | -0.015<br>(0.014)          | -0.010<br>(0.022)      | 0.140**<br>(0.058)                                 | -0.006<br>(0.014)    | -0.049***<br>(0.019)             | 0.001<br>(0.018)                        | 0.041<br>(0.025)                           | 0.007<br>(0.021)     |
| Unemployment Rate           | -0.089***<br>(0.009) | -0.091***<br>(0.012)     | -0.094***<br>(0.009)       | -0.084***<br>(0.009)   | -0.092***<br>(0.009)                               | -0.092***<br>(0.010) | -0.093***<br>(0.008)             | -0.093***<br>(0.009)                    | -0.097***<br>(0.007)                       | -0.085***<br>(0.010) |
| F statistics                | 14.32                | 12.81                    | 11.17                      | 12.23                  | 12.54                                              | 13.21                | 11.78                            | 12.55                                   | 13.07                                      | 11.78                |
| Endogeneity Test-Statistics | 2.298***             | 0.072***                 | 0.015***                   | 2.399***               | 1.270***                                           | 0.186*               | 1.932**                          | 0.374**                                 | 0.769***                                   | 0.098*               |
| <b>OLS</b>                  |                      |                          |                            |                        |                                                    |                      |                                  |                                         |                                            |                      |
| log JFR                     | -0.029<br>(0.021)    | -0.007<br>(0.028)        | -0.032<br>(0.021)          | -0.042<br>(0.030)      | 0.046<br>(0.073)                                   | -0.027<br>(0.024)    | -0.049**<br>(0.025)              | -0.034<br>(0.021)                       | 0.003<br>(0.025)                           | -0.020<br>(0.040)    |
| Unemployment Rate           | 0.001<br>(0.002)     | -0.002<br>(0.005)        | -0.002<br>(0.004)          | 0.006*<br>(0.003)      | -0.001<br>(0.010)                                  | -0.001<br>(0.003)    | -0.003<br>(0.002)                | -0.002<br>(0.003)                       | -0.006*<br>(0.003)                         | 0.002<br>(0.005)     |
| <b>IV</b>                   |                      |                          |                            |                        |                                                    |                      |                                  |                                         |                                            |                      |
| log JFR                     | -0.041*<br>(0.021)   | -0.033<br>(0.022)        | -0.049***<br>(0.019)       | -0.055**<br>(0.028)    | 0.093*<br>(0.051)                                  | -0.055**<br>(0.024)  | -0.089***<br>(0.031)             | -0.056**<br>(0.027)                     | -0.009<br>(0.032)                          | -0.041<br>(0.035)    |
| Unemployment Rate           | -0.087***<br>(0.007) | -0.089***<br>(0.012)     | -0.090***<br>(0.008)       | -0.082***<br>(0.009)   | -0.088***<br>(0.009)                               | -0.088***<br>(0.010) | -0.092***<br>(0.008)             | -0.088***<br>(0.008)                    | -0.093***<br>(0.007)                       | -0.086***<br>(0.010) |
| F statistics                | 14.71                | 11.23                    | 13.25                      | 12.90                  | 11.71                                              | 14.83                | 11.31                            | 13.73                                   | 12.11                                      | 11.92                |
| Endogeneity Test-Statistics | 0.050***             | 0.292***                 | 0.128**                    | 0.203***               | 0.654***                                           | 0.142*               | 3.070***                         | 0.200***                                | 0.411**                                    | 0.103*               |
| <b>Fixed Effects</b>        |                      |                          |                            |                        |                                                    |                      |                                  |                                         |                                            |                      |
| Year fixed effects          | Yes                  | Yes                      | Yes                        | Yes                    | Yes                                                | Yes                  | Yes                              | Yes                                     | Yes                                        | Yes                  |
| Region fixed effects        | Yes                  | Yes                      | Yes                        | Yes                    | Yes                                                | Yes                  | Yes                              | Yes                                     | Yes                                        | Yes                  |
| Other controls              | Yes                  | Yes                      | Yes                        | Yes                    | Yes                                                | Yes                  | Yes                              | Yes                                     | Yes                                        | Yes                  |

Robust standard errors presented in parentheses are clustered at the regional level. The data consist of yearly observations for each NUTS2-level region between 2009–2018. The number of observations is 156 in all regression models, and they include vectors of the NUTS2-level region and year-fixed effects.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 3.7 Conclusion and Discussion

Since 2011, European countries have experienced a significant inflow of Syrians because of the severe conflict in Syria, with Türkiye experiencing the greatest migration. Thus, Syrians are at the forefront of political debates across multiple arenas and fields of practice in these countries. In particular, the issue of how Syrians influence labor market conditions represent a central question that is largely investigated in labor economics (e.g., Balkan and Tumen, 2016; Ceritoglu et al., 2017; Del Carpio and Wagner, 2015; Tumen, 2016). However, researchers have largely ignored the effects of this migration on labor market efficiency, which is visualized through the Beveridge Curve. While a large and growing body of literature has investigated the factors and events that can cause shifts in the Beveridge Curve (e.g., Crawley, 2020; Holmes, 2020), few studies have examined the effect of immigration on the quantitative relationship between the job vacancy rate and unemployment rate (e.g., Anastasopoulos et al., 2020; Maffei-Faccioli and Vella, 2021; Schiman, 2021). In this context, the essay is the first to examine the impact of Syrians on the job vacancy rate and Beveridge Curve in Türkiye. To introduce this association, an instrumental variable approach was conducted. Job vacancy and placement statistics from the Turkish Employment Agency (ISKUR) and other variables, particularly the unemployment rate, from the Turkish Statistical Institute (TurkStat) at the aggregate NUTS2-level were used to investigate these phenomena between 2009–2015 and 2009–2018. In comparison to Holmlund (2018), the essay's data has two advantages. Firstly, there are no missing observations in the data. Secondly, vacancies involve the private sector rather than the public sector, where both immigrants and natives frequently apply.

This essay is the first attempt to illuminate the link between immigration and job vacancy rates and the Beveridge Curve. According to these findings, we would fail to reject all null hypotheses ( $H_1$ ,  $H_2$ ,  $H_3$ ,  $H_4$ ). The findings indicate that trends in job vacancies are directly related to Syrian-induced excess labor supply and that the decrease in job vacancies is particularly severe for low-skill jobs as well as high-skilled jobs such as managers. Moreover, the results also illustrate more efficient job matching due to a reduced mismatch between demand and supply in the Turkish labor market.

These results echo those published by Pholpirul (2013), which documented that immigration reduces short-term job vacancies.

Evidence shows that the Syrian shock shifted the Beveridge Curve inward between 2009–2015 and 2009–2018. These results are in line with the expectations and suggest that Syrians raise job-matching efficiency and improve labor market conditions by reducing the number of unfilled vacancies and job seekers for the given unemployment rate in the Turkish labor market. These findings correspond with the empirical evidence provided by Anastasopoulos et al. (2020), who used an instrumental variable approach to find an inward shift in the Beveridge Curve due to a reduced mismatch between employees and accessible job opportunities. The essay's findings are also similar to Schiman (2021), which asserts that the labor market in Australia became more efficient in matching unemployed job seekers to vacant positions because of labor supply shocks induced by job-related immigration. An earlier study by Ceritoglu et al. (2017), which delved into the effect of Syrian inflows on the job-finding probabilities of native individuals aged 15–64, found negative and statistically significant estimates, further confirming the essay's result.

Finally, the present essay offers evidence that the Syrian inflow has made finding jobs difficult for natives in most occupation groups, indicating an inward shift of the Beveridge Curve in these occupations. Another noteworthy finding is that the Beveridge Curve shifted outwardly only in the skilled agricultural, forestry, and fishery occupations in both time intervals. This implies that most Syrians are low-skilled, and as it is easier for them to move within the country as seasonal workers, they generally work more frequently than natives in this low-wage sector (Erdogan, 2020). In this case, job vacancy rates may increase the supply of labor willing to work for low wages. Thus, greater job vacancies at the same unemployment level will shift the Beveridge Curve to the right and cause inefficiency in this occupational group.

In conclusion, Syrians raise matching efficiency and improve labor market conditions by reducing the number of unfilled vacancies and job seekers for the given unemployment rate in the Turkish labor market. This essay provides an in-depth analysis of labor market efficiency which is essential for policy design and implementation. Accordingly, the political debate should also focus on redistributive measures that benefit both host communities and immigrants (e.g., Lejeune, and Martini, 2015; Harris, and La Croix, 2020). Moreover, the theoretical framework integrating immigration into the Beveridge curve is an area for future research.

## **4 IS THERE A LINK BETWEEN IMMIGRATION AND CRIME RATE?: EVIDENCE FROM SYRIAN INFLUX TO TÜRKİYE**

### **4.1 Introduction**

Both internal and international migration is an activity that has long-lasting effects on population dynamics. They are associated with many social, political, and economic challenges for both origin and destination communities. Effects of migration range from fertility (e.g., Bagavos, 2019) to population aging (Bijak et al., 2007) and future population size (Cangiano, 2016). It also has demographic consequences on education level (Hunt, 2017; Tumen, 2018), family formation, and marriage market (Angrist, 2002; Carlana and Tabellini, 2018; Lafortune, 2013). Unfortunately, faced with these changes and challenges, migrant communities many times become open to developing negative feelings provoked by hate speech and deliberately falsified information, exasperating and reinforcing prejudices. Competition over jobs, biases on social welfare spending, and increase in crime rates are among the most prominent discourses used by these circles (Baerg et al., 2018; Bordeau, 2009). To combat xenophobia and promote social cohesion, if need be, to take measures creating a favorable environment for both migrants and host communities, claimed negative effects of immigration need to be investigated along with the positive sides.

In 2017, 3.4% of the world population, approximately 258 million people were international migrants, “any person who changes his or her country of residence” (UNDESA, 2017). While many choose to migrate to other countries for improving their standards of living, many are forced to flee their homes because of persecution, conflict, generalized violence, or violations of human rights. Including the internally displaced, the number of people who are forcibly displaced increased from 43.3 million in 2009 to 70.8 million in 2018, of which 25.9 million are Syrians. For five consecutive years, between 2013 and 2018 Türkiye has been the country with the highest number of Syrians (UNHCR, 2019a).

Indeed, as of July 2019, approximately 3.64 million registered Syrians were living in Türkiye (UNHCR, 2019b). Like elsewhere in the world (Horowitz, 2018; Jebreal, 2018; Newport, 2018), from time to time negative sentiments and attitudes

towards immigrants, Syrians in the Turkish case, arise among the public (Getmansky et al., 2018). While Erdogan (2018) puts forth that the Turkish public displays somewhat reluctant social acceptance of Syrians, Türkiye is among the countries least accepting of immigrants according to the Migrant Acceptance Index (Fleming et al., 2018). Nearly, two-fifths of the population describe Syrians as dangerous people who are likely to create problems in the future, a statement reflecting the public's perception of the crime potential of Syrians. Furthermore, more than half associate Syrians with negative attributes, including laziness, filthiness, rudeness, and dangerousness (Erdogan, 2018). These negative perceptions underline prejudices towards the Syrians and signal the foundations of long-lasting social problems between the host and guest community.

Even though Syrian asylum seekers have been extended temporary protection, it is expected that most will not return to their homes any time soon (Kirisci and Ferris, 2015). Accordingly, the Turkish government, international organizations, and international and local NGOs stepped up their efforts for social cohesion. For any social cohesion effort to have a long-lasting effect, prejudices and misconceptions between the communities need to be eliminated. Aside from many other measures, hard evidence should be presented to the public falsifying the attributes. Analyzing the relationship between crime and immigration is a step toward this end.

Despite the importance of studying this effect, the task is a difficult one because of several econometric challenges. For example, the problem of selection is one of the most important issues encountered when nonexperimental immigration data are used (Borjas, 1987, Borjas, et al., 1992). One way to tackle this problem is by conducting a natural experiment in which immigrants do not self-select themselves into a host country. Previous studies have established that the Syrian inflow to Türkiye presents a quasi-experimental estimation opportunity (Balkan and Tumen, 2016). Therefore, in this essay, the effects of Syrians on crime rates in Türkiye were investigated using a difference-in-difference (DiD) approach.

The essay uses incarceration rates in Türkiye as a proxy for crime rates and resting itself on the difference-in-difference (DiD) method investigates if there is an association between immigration and crime. The essay is composed of seven subsections. The second section gives an overview of Syrian inflow into Türkiye and the third provides a review of the existing empirical literature on the relationship between immigration and crime. The fourth section introduces the data, estimating

methods, and the model. The fifth presents the results of the model. The sixth section documents robustness and finally the seventh section concludes.

## **4.2 Literature Review**

### **4.2.1 Theoretical Perspectives**

The existing theoretical literature presents different mechanisms through which immigration may lead to higher crime rates in host countries. The first theory, Demographic Transition, and Population Instability, explains that as migrants cause demographic transitions, they increase crime. This causality is clarified by two distinct conceptual arguments. The first argument is compositional and contends that immigration raises crime by increasing the proportion of individuals with criminal tendencies in the population. Indeed, studies show that males commit crimes at higher rates than females (e.g., Pastore and Maguire, 2008) and that crime rates are highest among teens and young adults (e.g., Hirschi and Gottfredson, 1983). The second argument is contextual and based on Social Disorganization Theory. According to this concept, crime rates will increase during times of great migration, since significant societal change circumvents the networks and institutions required for successful socialization and behavioral regulation. Since immigration is a factor causing population turnover or residential instability, migrants are a vigorous driver of population change and therefore increase crime rates (e.g., Lee et al., 2001; Reid et al., 2005). It is important to note that there is a substantial disparity between these two arguments: while the former implies that only recent immigrants amplify crime rates, the latter argues that all immigrant populations result in higher crime rates. The second theory, called Labor Market Structure and Economic Deprivation, elucidates a positive association between changes in immigration and crime by emphasizing the twin roles of economic opportunities and economic deprivation. For instance, if immigrants with lower levels of education, labor market skills, and job prospects than natives must dwell in or around urban ghettos (e.g., Hagan and Palloni, 1999), they will then be more vulnerable to unemployment, poverty, and other social problems (e.g., Butcher and Piehl, 1998). These economic pressures can exacerbate intergroup conflict and bring about marginalization from society. According to Opportunity Structure Theory, as this situation pushes migrants into alternative illegal economic pursuits (e.g., Lee et

al., 2001; Reid et al., 2005), the probability of them engaging in criminal activity in their host community will thus increase (e.g., Reid et al., 2005; Waldinger, 1997). In addition, studies show that immigrants create a new labor supply of low-skilled and underpaid workers (e.g., Waldinger 1997). In such cases, low-skilled natives may face dismissal from their jobs, because they cannot compete with these immigrants. At the same time, an excess of low-skill employees may augment the unemployment rate. Eventually, natives may tend to commit crimes due to the unfavorable impacts of immigrants (e.g., Reid et al., 2005; Butcher and Piehl, 1998).

On the other hand, opposite theoretical arguments contend that immigration may reduce crime rates. The first argument, called Immigrant Selection Effects, asserts that immigrants are not simply randomly selected people from their home country. Instead, they are individuals with relatively higher education and income levels than their peers, who migrate to work and live in better conditions or obtain more education (e.g., Alba and Nee, 1997)—that is, they have a low propensity for crime (e.g., Butcher and Piehl, 2005). Therefore, higher levels of immigration should strengthen the low-crime segment of the population, resulting in reduced crime over time. A second argument, Formal Social Control, relies on the idea that as a spike in immigration heightens concerns about crime rates in the host country, it causes the government to increase the local formal social control instruments (i.e., police force size), thereby actually reducing crime rates (e.g., Levitt, 2004). The final perspective, Social Capital and Family Structure illuminate the relationship through two distinct mechanisms. The first path argues that immigrants may provide employment and entrepreneurial prospects and such improvements may mitigate the detrimental impacts of economic hardship (e.g., Sampson, 2017), thereby resulting in a lower crime rate (e.g., Desmond and Kubrin, 2009). The second path suggests that since immigration changes family and household structures by supporting two-parent families and fortifying the legitimacy of parental authority norms and adhesion to rules in host societies (e.g., Martinez et al., 2004), immigrants may establish or sustain family ties and social networks, thus decreasing crime rates by alleviating family disruption and dampening culture conflict (e.g., Sampson et al., 2005).

Furthermore, an early economic theory introduced by Becker (1968) indicates two mechanisms that express positive and negative links between immigration and crime. The first mechanism, positive relation, explains that if immigrants are less qualified than natives—through lower education, lower wage, and/or lower language

proficiency—they are less likely to participate in the formal labor market than locals. Thus, this mechanism may lead them to commit property crimes, even if they are not violent crimes. The second mechanism asserts that if immigrants have lower wages and employment rates than natives, they may have a higher likelihood of going to prison. Therefore, immigrants may cause an increase in crime due to the negative spillover effect, even if the immigrants commit less crime (Borjas et al., 2010). As for negative association, the first argument maintains that immigrants can economically improve natives' economic opportunities by bringing their social capital to the regions where they migrate, and thus, they may decrease crime rates due to the positive spillover effect (Putnam, 2000). The second argument claims that the cost of committing a crime is higher for immigrants than for natives since immigrants face the danger of expulsion from the country in addition to typical punishments. This threat is an important deterrent to lower their criminal engagement.

#### **4.2.2 Studies on the Relationship between Immigration and Crime**

Studies have delved into the relationship between immigration and crime (e.g., Bigo, 2017; Bianchi et al., 2012). More specifically, these studies reviewed either the relationship between the legal status of migrants and their criminal activity (e.g., Pinotti, 2017) or between inflows of immigrants and criminal activity. Studies in the United States have reached a consensus on this issue, establishing a negative relationship between migration and crime (Chalfin, 2015; Lee et al., 2001; Moehling and Piehl, 2011; Spenkuch, 2014). A recent systematic review of the literature for the United States, focusing on studies published between 1994 and 2014, attributed the different findings of studies examining the relationship between rates of crime and levels of immigration to variability in the measurement methods for immigration and crime, the studies' units of analysis, the temporal design, and destination context (Ousey and Kubrin, 2018). The reviewers suggest that these studies typically find no significant association between rates of crime and levels of immigration, noting that 62% of the studies under review indicated no statistical significance at a 5% confidence level. Furthermore, the majority of the statistically significant regression coefficients were negative, and there were 2.5 times more studies finding significant negative effects than studies finding positive effects.

However, studies on European contexts illustrate contradictory outcomes. Some researchers have shown that areas with higher pre-existing levels of crime that face

overpopulation after an influx of immigration experience higher crime rates (e.g., Bianchi et al., 2012). Other scholars have found no causal positive impact of immigration on crime (Jaitman and Machin, 2013).

#### **4.2.3 Studies on the Relationship between Refugees/Asylum Seekers and Crime**

Much of the existing research has focused on the link between crime rates and levels of immigration; however, little attention has been paid to the criminal behavior of refugees and asylum seekers. Studies focusing on European countries have emphasized that the link between refugees/asylum seekers and crime depends on their weak labor market integration (Bevelander, 2016), which varies due to differences in refugee resettlement policies in European countries (Fasani et al., 2018). For instance, Bell et al., (2013) examined local violent and property crime patterns in England and Wales between 2002 and 2009. The results of their study show that although there was no significant increase in the rates of violent crime for the asylum, A8 waves had a statistically negative effect on property crime. By contrast, a study that evaluated the short-run effects of the influx of refugees into 16 German states in 2014 and 2015 found an increase in the rate of nonviolent crimes, especially those related to drug offenses and fare-dodging, due to a lack of economic opportunities (Gehrsitz and Ungerer, 2022). These two studies attribute the increase in crime rates to the lack of employment opportunities for newcomer refugees/asylees in the receiving countries. In another study, asylum seekers who were exposed to civil conflict or mass killings between age 1–12 were found to be 40% more prone to commit violent crimes than the average member of their age cohort in Switzerland during the period from 2009 to 2012; however, giving asylum seekers access to the labor market access diminished two-thirds of the effects of those asylum seekers on violent crimes (Couttenier et al., 2016). Similarly, Simmler et al., (2017) found that refugees commit more police-reported crimes than natives in Switzerland, which they attributed to refugees' lack of access to employers and education prospects.

Contrary to Europe, refugees in the US are estimated to engage in relatively lower levels of criminal activity (Park and Buchanan, 2017), since they can typically access the labor market immediately after relocation due to factors such as entrepreneurial networks of members from the same country of origin (Dagnelie et al.,

2019), connections to other immigrants in the same network who arrived around the same time (Beaman, 2012), higher rates of human capital accumulation (Cortes, 2004), and refugee wage gains (Giri, 2016; Evans and Fitzgerald, 2017). A recent article on the relation between the rate of refugee settlement and local crime rates in the U.S. indicates that refugees may not have had a significant effect on local crime rates during the period from 2006 to 2014. Even when the researchers restricted the sample to refugees who came from the seven countries on which a travel ban was imposed by executive order on January 27, 2017, they did not find any statistically significant evidence of a relationship between the level of the refugee inflow and an increase in the rates of crime (Amuedo-Dorantes et al., 2021). These findings are based on the accelerated assimilation of refugees, that is, their rapid participation in the labor market, and the lower overall numbers of refugees migrating to the US compared to European countries.

#### **4.2.4 Relationship between Crime and Incarceration Rate**

The literature delineates three main causal mechanisms that influence the association between imprisonment and crime. First, jails incapacitate criminals. Second, the possibility of imprisonment may serve as a deterrent to criminal activity. Third, time served in prison can influence the possibility of future delinquency for inmates, either through rehabilitation or toughening the living conditions of prisoners. While the first two mechanisms potentially cause a contemporaneous negative link between criminal offenses and imprisonment levels, the latter mechanism is more likely to cause a dispersed delayed effect of incarceration on crime that might be positive or negative.

The potential interrelation between incarceration and crime poses a major methodological challenge for researchers to overcome. Exogenous increases in the use of incarceration, for example, will incapacitate more individuals and possibly provide a higher deterrent effect (constituting a negative relationship between incarceration and crime), whereas exogenous increases in crime for inducements unassociated with criminal justice policy will result in a positive change in incarceration rates and crime. Failure to elucidate the endogeneity of imprisonment rates results in crime-prison impacts that skew toward zero. Most scholars address this issue by utilizing the two-stage least square or instrumental variable method, which in turn has found a negative causal relationship between incarceration rate and crime (e.g., Johnson and Raphael,

2012; Raphael and Stoll, 2013). In addition, Levitt (1996) was the first to highlight this identification problem, finding estimates of approximately  $-0.3$  and  $-0.4$  for property crime-prison elasticity and violent crime-prison elasticity, respectively.

### **4.3 An Assessment of the Relationship between Syrians and Incarceration Rate (Crime) around the Theoretical Perspectives**

After the civil war in Syria, massive populations of Syrians migrating to Türkiye had to break their ties with their home country, making it difficult to return and rebuild their old lives. In this section, the possible effects of Syrians on the incarceration rate in Türkiye are discussed, in line with the previously mentioned theories. This theoretical analysis provides potential reasons for both increases and decreases in incarceration (crime) rates.

Most Syrians residing in Türkiye are young men with low levels of education—all features that the literature highlights as determinants of crime (e.g., Butcher and Piehl, 2007). Thus, the Demographic Transition and Population Instability theory poses that incarceration rates could increase in Türkiye. Moreover, sudden and unexpected Syrian flows may cause social deformation and disruptions in the implementation of formal and informal norms and rules. According to the Social Disorganization theory, one would expect Syrians to stimulate crime rates. As Syrians face difficulties such as language barriers, different working cultures, and low levels of education, they may in turn have fewer work opportunities and experience economic difficulties. For this reason, Labor Market Structure and Economic Deprivation and Opportunity Structure, as well as Becker's economic theory hypothesize that they are likely to apply for an illegal job or be involved in crime.

On the other hand, Syrian students have gained significant access to education in Türkiye over the years, with near gender parity across the number of Syrian students studying in Turkish schools (49.18% of the Syrian students are girls and 50.82% are boys, respectively). Furthermore, after the influx of Syrians in Türkiye, the expected return of low-skilled labor reduces, bringing with it a decline in labor market opportunities for natives. This increases high school enrollment rates among youth, who would otherwise be more likely to drop out of school early and work bad jobs, particularly among males with lower parental education levels (e.g., Tumen, 2021).

Considering the negative relationship between education and crime in Türkiye (e.g., Tekeli and Gunsoy, 2013), it is reasonable to expect that the influx of Syrians decreases or does not affect incarceration rates for these two reasons.

According to the statistics published by Eurostat, while there are 318 police officers per 100,000 people in European countries, this number reached 540 in Türkiye over the past decade, making it rank second in Europe (Independent Turkish, 2019; Euronews Turkish, 2020). Therefore, according to the theory of Formal Social Control, a reduction in incarceration rates in the country could be possible. Another issue is that, since Türkiye has experienced intense internal migration throughout its history, it has a dynamic social structure. Additionally, Adana, Sanlıurfa, Hatay, Gaziantep, and Mardin are all located close to Türkiye's Syrian border, have high kinship relations with Syria, and host a disproportionate number of Syrians in comparison to their native populations. Thus, the social context in these cities, with their intense and rapid migration rates, differs greatly from others in Türkiye, thus Syrians there may not encounter negative stereotypes or attitudes toward them (Erdogan, 2020). Therefore, according to the Family Structure view, there could be a decrease in incarceration rates or even no impact because it may be easier for natives to accept Syrians and for Syrians to integrate into their host environment. Moreover, Türkiye has a robust informal economy, and Syrians with the features mentioned above tend to work informally in manual jobs in small or medium-sized businesses and make a positive contribution to local companies (Erdogan, 2020). One study found that entrepreneurial activity has increased significantly in Türkiye in recent years since Syrians brought in and invested most of their accumulated wealth. This situation benefits both labor market sectors (e.g., construction) and natives (e.g., Altindag et al., 2020). For both reasons, the Social Capital theory can attest that these migrants will not increase crime.

Within the framework of the above theories, contrary to the positive relationship found in Europe, one can expect a negative relationship or no relationship between Syrians and crime in Türkiye. Thus, the essay examined the following six hypotheses:

H<sub>1</sub> = The Syrian inflow has increased the incarceration rate from theft in Türkiye.

H<sub>2</sub> = The Syrian inflow has increased the incarceration rate from assault in Türkiye.

H<sub>3</sub> = The Syrian inflow has increased the incarceration rate from homicide in Türkiye.

H<sub>4</sub> = The Syrian inflow has increased the incarceration rate from non-income generating crime in Türkiye.

H<sub>5</sub> = The Syrian inflow has increased the incarceration rate from income-generating crime in Türkiye.

H<sub>6</sub> = The Syrian inflow has increased the total incarceration rate in Türkiye.

## 4.4 Methodology

### 4.4.1 Data

Previous literature uses the incarcerations rate as a proxy for involvement in criminal activity (Bell et al., 2013; Borjas et al., 2010; Butcher and Piehl, 1998; Butcher and Piehl, 2000; Butcher and Piehl, 2007; Chalfin, 2013; Moehling and Piehl, 2009). Accordingly, the crime datasets used in this essay were based on Turkish penal institution statistics for the period 2009 to 2015.<sup>26</sup> The crime data on 25 criminal activities are annually published by the Turkish Statistical Institute (TurkStat) and formulated as cross-sectional data at a given point in a year for all Turkish provinces. These statistics only include sentenced individuals; thus, individuals under pre-trial detention or detention for other reasons (e.g., for immigration reasons) were not included in the dataset. Thus, these incarceration rate statistics are perceived as strictly reflective of crime. Moreover, since the dependent variable is imprisonment rates for each province, this analysis cannot illustrate whether individual Syrians committed crimes and then became incarcerated. In the dataset, the province indicated is where the crime was committed, not the penitentiary's location. As the data covered only the civilian population, crimes against military criminal law are excluded. In any case, crimes against military criminal law are not related to Syrians. Moreover, opposition to the Bankruptcy and Enforcement Law has not included analysis as they are not related to immigrants. Similar to the previous literature, crime types are classified into two groups non-income-generating and income-generating. While non-income-generating crimes include 13 crime types, income-generating crimes include 9 (e.g., Freedman et al. 2018).<sup>27</sup> Non-income-generating crimes are homicide, assault, sexual

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<sup>26</sup> The data after 2015 was not used because, in Türkiye, incarceration rates rose steeply because of the investigations of the military coup attempt on 15<sup>th</sup> July 2016.

<sup>27</sup> The number of theft and robbery crime types are summed up due to small figures and named as theft.

crimes, kidnapping, defamation, bad treatment, prevention of performance, traffic crimes, forestry crimes, crimes related to firearms and knives, criminal threats, damage to property, and acts contrary to the measures for family protection. On the other hand, income-generating crimes consist of theft, smuggling, opposition to cheque laws, swindling, use and purchase of drugs, production, and sale of drugs, forgery, embezzlement, and bribery. In this essay, six different crime categories were assessed. These are non-income-generating crimes, income-generating crimes, theft, assault, homicide, and total crime. The total crime was generated by aggregating all available crime types, except for crimes against military criminal law and under bankruptcy laws. The dependent variable is the logarithm of the proportion of these crime types per thousand residents (e.g., Freedman et al., 2018).

In 2002, TurkStat implemented the Nomenclature of Territorial Units for Statistics (NUTS) within the framework of the EU accession period. There are three classifications for Türkiye: NUTS1 (12 regions), NUTS2 (26 subregions), and NUTS3 (81 provinces). Namely, at the NUTS2-level regional division, previous essays have included as their treatment group TR62 (Adana and Mersin), TR63 (Hatay, Kahramanmaraş, and Osmaniye), TRC1 (Gaziantep, Adıyaman, and Kilis), TRC2 (Sanliurfa and Diyarbakir), and TRC3 (Mardin, Batman, Şırnak, and Siirt) and the control group includes TRA1 (Erzurum, Erzincan, and Bayburt), TRA2 (Ağrı, Kars, Iğdır, and Ardahan), TRB1 (Malatya, Elazığ, Bingöl, and Tunceli), and TRB2 (Van, Muş, Bitlis, and Hakkari). However, to make the essay comparable with other work in this area, the treatment and control groups were formed in line with those of the previous studies. Thus, the analyses are based on provincial incarceration data (NUTS3), which allowed to conduct deeper analyses than previous studies.

Previous literature that focuses on the influx of Syrians to Türkiye utilizes the NUTS2 classification (e.g., Balkan and Tumen, 2016; Tumen, 2016). The analysis was conducted based on province crime data (NUTS3), which is more advantageous. However, to be compatible with previous studies, treatment and control groups are constituted in line with recent studies (Ceritoglu et al., 2017). The treatment area included 14 provinces<sup>28</sup> from the southeastern part of Türkiye where the proportion of

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<sup>28</sup> At the NUTS2-level regional division; the treatment group includes TR62 (Adana, Mersin), TR63 (Hatay, Kahramanmaraş, Osmaniye), TRC1 (Gaziantep, Adıyaman, Kilis), TRC2 (Sanliurfa, Diyarbakir), and TRC3 (Mardin, Batman, Şırnak, Siirt).

Syrians to the population is above 2% (AFAD, 2014), and the control area included 15 provinces<sup>29</sup>. Provinces in the control area in which the ratio of Syrians to the population is close to zero have similar cultural properties, socio-demographic aspects, and economic development levels that of the treatment area. Table 3.1 illustrates how these treatment and control groups were constituted. Figure 3.5 shows a map of Türkiye on which the ratio of immigrants to natives was highlighted for treatment and control areas in 2015.

In this essay, control variables used in the analysis are based on previous literature (e.g., Amuedo-Dorantes et al., 2018; Spenkuch, 2014). Total employment, real GDP per capita, and education level variables are obtained from the TurkStat at the province level. Total employment is the employment rate at the province level. Real GDP per capita is calculated as deflating per capita by using the consumer price index (CPI). Concerning the education level of individuals, two groups were created: those with a high school degree or lower and those who have a higher degree than high school diplomas per thousand residents. To proxy for the likelihood of getting caught by law enforcement, the proportion of lawyers registered with the Bar Association per thousand residents (the Republic of Türkiye Ministry of Justice 2019) was controlled. Housing costs are considered a prominent determinant of Syrian placements, so the house price index that varies yearly for NUTS2-level regional divisions (Central Bank of the Turkish Republic, 2019) was included. Religiosity is another crucial factor in the explanation of crime; thus, the proportion of participants in Quran courses is controlled in the analysis (e.g., Brettfield and Wetzels, 2006). The data is obtained from the Presidency of Religious Affairs. Moreover, year and province dummies are included in the models.

According to statistics from Turkish penal institutions, the number of inmates in prisons has increased between 2009 and 2015. Thus, the period between 2010 and 2015 was focused on for the primary analysis. Since Syrians started to arrive in Türkiye at the beginning of 2012, a year interval is constituted around this cutoff date: the pre-Syrian period is defined as 2010–2011, and the post-Syrian period as 2012–2014. Moreover, the same analysis was conducted with a robustness check for different year intervals 2009–2015 (defined as long-term).

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<sup>29</sup> The control group includes TRA1 (Erzurum, Erzincan, Bayburt), TRA2 (Agri, Kars, Iğdir, Ardahan), TRB1 (Malatya, Elazığ, Bingöl, Tunceli), and TRB2 (Van, Mus, Bitlis, Hakkari).

Table 4.1 presents summary statistics for 14 variables related to crime, education, employment, and lifestyle, for a treatment group over the period 2010-2015. The treatment group consists of individuals who received a specific intervention, and the variables provide information on the outcomes of the intervention.

The first three variables in the table represent the incidence of three different types of crime - theft, assault, and homicide. The mean values for these variables are 0.22, 0.15, and 0.06, respectively. This suggests that theft is the most common crime, followed by assault and homicide. The standard deviations (SD) for these variables are 0.20, 0.12, and 0.04, respectively, indicating that there is some variability in the incidence of these crimes.

The next two variables in the table represent the incarceration rates for the treatment group, broken down into two categories - non-income-generating and income-generating incarceration. The mean values for these variables are 0.44 and 0.52, respectively. This suggests that the majority of incarcerations in the treatment group are income-generating. The standard deviations for these variables are 0.33 and 0.41, respectively, indicating that there is some variability in the rates of incarceration.

The total incarceration rate for the treatment group is also reported in the table, with a mean value of 1.13 and a standard deviation of 0.82. This indicates that, on average, each member of the treatment group is incarcerated for a little over a year during the period under consideration.

The number of lawyers/counselors per treatment group member is also reported in the table, with a mean value of 0.48 and a standard deviation of 0.24. This suggests that there is some variability in the availability of legal assistance and counseling for members of the treatment group.

The next two variables in the table represent the level of education for the treatment group. The first variable reports the mean income for those with less than a higher degree, which is 584.29, with a standard deviation of 43.22. The second variable reports the mean income for those with a higher degree, which is 57.72, with a standard deviation of 25.04. This suggests that individuals with a higher degree earn considerably more than those without one.

The per capita gross domestic product (GDP) for the treatment group is also reported in the table, with a mean value of 5552.92 and a standard deviation of 1508.35. This indicates that the treatment group is relatively well-off economically.

The next variable in the table reports the total employment rate for the treatment group, with a mean value of 0.01 and a standard deviation of 0.00. This suggests that the treatment group is not heavily employed.

The housing price for the treatment group is also reported in the table, with a mean value of 161.35 and a standard deviation of 42.37. This indicates that the housing market in the area where the treatment group is located is relatively stable.

Finally, the number of participants in Quran courses is reported in the table, with a mean value of 7.00 and a standard deviation of 6.76. This suggests that there is some interest in religious education among the members of the treatment group.

In contrast, the control group has a higher incidence of theft, assault, and non-income-generating incarceration rate. Regarding the crime variables, the mean incidence of theft in the control group is 0.15, which is lower than the treatment group. The mean incidence of assault is 0.18, which is higher than the treatment group. The mean incidence of homicide is the same in both groups at 0.05. The control group has a higher incidence of non-income-generating incarceration rate with a mean of 0.46 compared to the treatment group, and a lower incidence of income-generating incarceration rate with a mean of 0.37 compared to the treatment group. The mean total incarceration rate in the control group is 1.03, which is lower than the treatment group.

In terms of education, the control group has a higher mean for having less than a higher degree at 609.49, compared to the treatment group. The mean for having a higher degree is lower in the control group at 63.35 compared to the treatment group.

Regarding economic variables, the mean per capita GDP in the control group is slightly lower than the treatment group at 5430.31. The mean total employment is higher in the control group at 0.03 compared to the treatment group. The mean housing price in the control group is slightly lower than the treatment group at 147.71.

Finally, the mean number of participants in Quran courses is higher in the control group at 8.72 compared to the treatment group.

Table 4.1: Summary Statistics (2010–2015).

| Treatment Group                  |             |         |         |         |          |
|----------------------------------|-------------|---------|---------|---------|----------|
| Variable Names                   | Observation | Mean    | SD      | Min     | Max      |
| Theft                            | 168         | 0.22    | 0.20    | 0       | 1        |
| Assault                          | 168         | 0.15    | 0.12    | 0       | 0.50     |
| Homicide                         | 168         | 0.06    | 0.04    | 0       | 0.16     |
| Non-income-generating            | 168         | 0.44    | 0.33    | 0.04    | 1.40     |
| Income-generating incarceration  | 168         | 0.52    | 0.41    | 0.04    | 2.05     |
| Total incarceration rate         | 168         | 1.13    | 0.82    | 0.10    | 3.87     |
| Lawyers/counselors               | 168         | 0.48    | 0.24    | 0.02    | 1.36     |
| Having less than a higher degree | 140         | 584.29  | 43.22   | 476.88  | 651.91   |
| Having higher degree             | 140         | 57.72   | 25.04   | 13.25   | 120.47   |
| Per capita GDP                   | 168         | 5552.92 | 1508.35 | 3128.86 | 10028.97 |
| Total employment                 | 168         | 0.01    | 0.00    | 0.00    | 0.04     |
| Housing price                    | 112         | 161.35  | 42.37   | 102.92  | 268.73   |
| Participants in Quran courses    | 154         | 7.00    | 6.76    | 0.15    | 34.75    |
| Control Group                    |             |         |         |         |          |
| Variable Names                   | Observation | Mean    | SD      | Min     | Max      |
| Theft                            | 180         | 0.15    | 0.14    | 0       | 0.72     |
| Assault                          | 180         | 0.18    | 0.17    | 0       | 1.11     |
| Homicide                         | 180         | 0.05    | 0.04    | 0       | 0.18     |
| Non-income-generating            | 180         | 0.46    | 0.38    | 0.03    | 2.15     |
| Income-generating incarceration  | 180         | 0.37    | 0.26    | 0.02    | 1.33     |
| Total incarceration rate         | 180         | 1.03    | 0.70    | 0.06    | 3.15     |
| Lawyers/counselors               | 180         | 0.41    | 0.21    | 0.08    | 0.95     |
| Having less than a higher degree | 150         | 609.49  | 55.11   | 457.18  | 730.55   |
| Having higher degree             | 150         | 63.35   | 31.95   | 11.14   | 161.44   |
| Per capita GDP                   | 180         | 5430.31 | 1742.38 | 2532.40 | 10896.62 |
| Total employment                 | 180         | 0.03    | 0.01    | 0.01    | 0.04     |
| Housing price                    | 120         | 147.71  | 32.59   | 103.54  | 242.9    |
| Participants in Quran courses    | 165         | 8.72    | 8.51    | 0.23    | 30.10    |

Notes: The incarceration rate dataset used in this essay came from statistics of the Turkish Statistical Institute (TurkStat), which collected data from Turkish penal institutions during the period from 2010 to 2015. All variables' summary statistics are expressed considering their definitions in the essay.

Crimes included in the non-income-generating incarceration rates are homicide, assault, sexual crimes, kidnapping, defamation, bad treatment, prevention of performance, traffic crimes, forestry crimes, crimes related to firearms and knives, criminal threats, damage to property, and crimes contrary to the measures for family protection. Crimes included in the income-generating incarceration rates are theft, smuggling, opposition to cheque laws, swindling, use and purchase of drugs, production, and sale of drugs, forgery, embezzlement, and bribery. Total incarceration rates were generated by aggregating all incarceration rate types into two groups: non-income-generating incarceration rates and income-generating incarceration rates.

Table 4.2 shows the incarceration rates recorded during the periods before and after 2012. As shown, the incarceration rates after 2012 increased for both the treatment and control groups. Moreover, for both the treatment group and control group, there was an increase in the rates of incarceration rates between the pre-Syrian and post-Syrian periods.

Table 4.2: The Changes in Incarceration Rates in Treatment and Control Groups from 2010–2015.

| Incarceration Rate                       | 2010-2011       |               | 2012-2015       |               |
|------------------------------------------|-----------------|---------------|-----------------|---------------|
|                                          | Treatment Group | Control Group | Treatment Group | Control Group |
| Theft                                    | 7.415           | 5.322         | 28.613          | 21.501        |
| Assault                                  | 6.802           | 8.214         | 16.718          | 23.443        |
| Homicide                                 | 2.924           | 2.827         | 6.313           | 6.610         |
| Non-income-generating incarceration rate | 21.823          | 19.200        | 47.780          | 59.239        |
| Income-generating incarceration rate     | 22.075          | 17.506        | 60.882          | 46.388        |
| Total incarceration rate                 | 49.615          | 43.114        | 127.173         | 130.621       |

Notes: Since Syrians started to come into Türkiye at the beginning of 2012, a symmetric year interval is constituted around this cutoff date. The dataset includes only the civilian population. The incarceration rates represent the proportion of incarcerated per thousand residents.

## 4.4.2 Estimation Strategies

### 4.4.2.1 Difference-in-Difference Method

The scientific investigation of the effect of immigration levels on the rates of incarceration for Syrian host countries is essential to the design of better policies—for such policies must be grounded in reliable and valid data. However, categorizing the association between the two (the level of immigration and the rate of incarceration) is not as easy as it would seem, due to several econometric challenges. For example, the problem of selection is one of the most common issues encountered when using non-experimental immigration data (Borjas, 1987). One way to tackle this problem is by

using a natural experiment in which immigrants do not self-select themselves into a host country.

Previous studies have established that the inflow of Syrians into Türkiye represents an appropriate context for deploying a quasi-experimental estimation strategy. Therefore, to estimate the effects of the level of the influx of Syrians on the incarceration rate, the first method we employed is based on the Difference in Difference (DiD) approach implemented by Balkan and Tumen (2016), Ceritoglu et al., (2017), and Tumen (2018). Later, three different statistical approaches were applied to check robustness: the Panel Event Study, the Synthetic Control Method (SCM), and an Instrumental Variable approach (IV).<sup>30</sup>

In this essay, the quasi-experimental estimation strategy aimed to estimate the effect of the level of the influx of Syrians by comparing the number of incarcerations during the pre-Syrian and post-Syrian periods from 2010 to 2015 in both the treatment and control provinces. To achieve this goal, two dummy variables were created: (i)  $T = 1$ , if the province is in the treatment area; otherwise,  $T = 0$ ; and (ii)  $P = 1$  for the post-Syrian period (2012, 2013, 2014, and 2015) and  $P = 0$  for the pre-Syrian period (2010 and 2011). This framework led to the following DiD formula:

$$\ln(IncRate_{i,j,t}) = \beta_1 + \beta_2(T_i \cdot P_i) + \beta_3 X_{i,j,t} + f_j + f_t + \varepsilon_{i,j,t}, \quad (4.1)$$

where  $i$ ,  $j$ , and  $t$  are the index provinces, areas, and years, respectively. In this model, the dependent variable is the logarithm of the proportion of incarceration per thousand residents,  $X$  is a vector of the province-level socioeconomic variables, and  $\varepsilon$  is an error term. The elements  $f_i$  and  $f_j$  are the region-level and year-level Fixed Effects (FE), respectively. The main coefficient of interest is  $\beta_2$ , which renders the average change in the incarceration rates in the treatment area as a result of the influx of Syrians.<sup>31</sup> Furthermore, weighting is useful when estimating the causal effects. If the sample is exogenous and the model is correctly defined, the ordinary least squares (OLS) and weighted least squares (WLS) are used to estimate the consistent regression coefficients (Solon et al., 2015). Thus, WLS was also estimated by using the total population of each province for the weighting tool in the DiD method; this estimation is referred to as Model 2. Cluster models with and without weight were also executed

<sup>30</sup> We performed the Panel Event study introduced by Clarke and Schythe (2020) for each of the years 2010–2015, to see if the differences over time between the treatment and control groups were similar to those at baseline in the absence of treatment. For more detailed information see 4.4.2.2.

<sup>31</sup> See Tumen (2016), Balkan and Tumen (2016), and Ceritoglu et al. (2017) for details on a similar empirical setup.

to make a robustness check. In these calculations, the standard errors are clustered with respect to each province, and the total population of each province is used as a weight.

#### **4.4.2.2 Panel Event Study**

Panel Event Study is a statistical method used to analyze the effects of an event on a set of panel data (Borusyak et al., 2022). It is particularly useful for examining the impact of a discrete event, such as a policy change or a natural disaster, on a group of individuals or firms over time (Gormley and Matsa, 2014).

The basic idea behind Panel Event Study is to compare the outcome variable of interest, such as stock prices or employment rates, for the group of individuals or firms affected by the event, to the outcome variable for a control group of similar individuals or firms not affected by the event (Matsa and Miller, 2013).

The analysis typically involves running a regression of the outcome variable on a set of control variables, as well as a dummy variable indicating whether the event occurred. The coefficient on the dummy variable represents the effect of the event on the outcome variable while controlling for other factors that may also influence the outcome variable (Borusyak et al., 2022).

One advantage of a Panel Event Study is that it can account for unobserved heterogeneity across the panel units, such as differences in individual or firm characteristics that may affect the outcome variable. This is accomplished through the use of fixed effects or random effects models, which control for time-invariant differences across the units (Wooldridge, 2010).

Panel Event Study can also account for the dynamic effects of the event over time. For example, the effect of a policy change on stock prices may be immediate but then dissipate over time as the market adjusts. Panel Event Study can capture these dynamic effects by including lagged terms of the event dummy variable in the regression (Gormley and Matsa, 2014).

Another advantage of the Panel Event Study is that it can be used to estimate the average treatment effect on the treated (ATT), which measures the effect of the event on the group of units directly affected by the event. This is useful for policy evaluation, as it allows researchers to estimate the effectiveness of a policy change on the targeted group (Imbens and Wooldridge, 2009).

One potential limitation of the Panel Event Study is that it relies on the assumption that the control group is similar to the treated group in all relevant respects, except for the occurrence of the event. This assumption may be violated if there are unobserved differences between the groups, or if the event affects the control group in indirect ways (Borusyak et al., 2022).

Another potential limitation is that Panel Event Study may be subject to endogeneity bias if there are factors that influence both the occurrence of the event and the outcome variable of interest. To address this, researchers may use instrumental variables or difference-in-differences methods to estimate the causal effect of the event (Wooldridge, 2010).

In conclusion, Panel Event Study is a useful statistical method for analyzing the effects of an event on a set of panel data. It can account for unobserved heterogeneity, and dynamic effects, and estimate the average treatment effect on the treated. However, it relies on assumptions that may be violated and may be subject to endogeneity bias. Therefore, careful consideration should be given to the choice of the control group and appropriate methods to address potential biases (Gormley and Matsa, 2014).

The Panel Event study introduced by Clarke and Schythe (2020) was performed for each of the years 2010–2015, to see if the differences over time between the treatment and control groups were similar to those at baseline in the absence of treatment. Moreover, under a limited number of clusters, the estimator exhibits a downward bias, resulting in excess rejection of the null hypothesis. The difficulty worsens when, in addition to a limited number of clusters in the design, the event happens in a small number of clusters. Because the essay’s quasi-experimental design had just 26 regions, with the event occurring in only 5 of them, we preferred to calculate standard errors employing a wild cluster bootstrap as suggested by MacKinnon and Webb (2018).

A concern with the estimates from equation (4.1) refers to the validity of the so-called parallel trends assumption, according to which *IncRate* would have trended parallelly in the treated and control provinces in the absence of Syrian influx. While the counterfactual can not observe, event studies were conducted to examine if *IncRate* already trended differently in the treated provinces, relative to other provinces, before the Syrian influx by estimating equation (4.2):

$$IncRate_{tp} = \sum_{t=1, \neq 0}^4 \beta_{1,t} \cdot T_i \times 1(I_t = 1) + X_{p,t}\gamma + \delta_p + \delta_t + \varepsilon_{p,t} \quad (4.2)$$

The indicator function  $1(I_t = 1)$  represents the  $t^{th}$  a year before/after the refugee influx, which is used as a reference. All other regressors (X) remain the same as in equation (4.1).

#### 4.4.2.3 Synthetic Control Method

To identify the causal effect of the Syrian shock, it is important to select the comparison areas properly so that they are representative of the treatment areas. For this reason, to facilitate a robustness assessment for the DiD approach, the SCM was used on the data from 2006 to 2015 to reproduce the counterfactual group for the treatment group in the absence of the Syrian influx. It is worth noting that the SCM analysis starts in 2006 because the credibility of SCM depends on the longer length of time before intervention (Abadie et al., 2015); thus, synthetic control was conducted during this longer period to ensure the most reliable estimates from each method. SCM was first introduced by Abadie and Gardeazabal (2003) and then further developed by Abadie and colleagues (2010, 2015). The main goal of this econometric technique is to overcome the problem of choosing the best comparison group, referred to as the “synthetic control unit.” A p-value can be calculated for how significant the post-treatment difference is when compared to the pre-treatment relative to the whole distribution, thus constructing an inference for idiosyncratic province-specific shocks.

Therefore, the SCM was used to construct a weighted combination of potential control units to be used as the counterfactual.<sup>32</sup> As mentioned before, the synthetic control uses the best possible arrangement of donor weights that reduce the gap between incarceration per thousand residents in provinces where the Syrian populations are concentrated, and its synthetic control is as follows:

$$\min \left( IncRate - \sum_{p=1}^m IncRate_p W \right)^2 \text{ subject to } w_p > 0 \quad (4.3)$$

where  $p$  represents the number of donor provinces, and  $W$  is a  $(p \times 1)$  vector of non-negative weights (Abadie, Diamond, and Hainmueller, 2010; Abadie and Gardeazabal, 2003). Using that control group, equation (4.1) WLS was estimated. Standard errors are clustered at the province level.

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<sup>32</sup> For more detailed information on Synthetic Control Method see section 3.3.2.2.

#### 4.4.2.4 Instrumental Variable Approach

Both the SCM and the DiD approaches do not account for the endogeneity of the settlement patterns of Syrians. In this respect, similar studies typically also use the instrumental variable method to focus on the effects of the influx of Syrians. Therefore, the difference-in-difference approach commonly used in previous studies (Aksu et al., 2018; Del Carpio and Wagner, 2015) was applied. However, first, the OLS results were reported so that readers can easily compare these results with the DiD. Since OLS can also suffer from the endogeneity of Syrian location decisions, which are likely correlated with unobservable variables, it can present spurious results. Thus, the following regression was applied:

$$IncRate_{tp} = \alpha + \gamma P_{pt} + f_t(D_p) + g(X_{pt}) + \delta_p + \delta_t + \varepsilon_{pt} \quad (4.4)$$

where  $p$  denotes the province in Türkiye,  $t$  denotes the year, and the dependent variables are the incarceration rate including several crime types (the dependent variable is the logarithm of the proportion of incarceration per thousand residents), the main variable of interest is the number of Syrians normalized by the population  $P$  of a province,  $P_{pt}$ ,  $D$  is a high-order polynomial of the inverse distance, and the aforementioned control variables have been used,  $X_{pt}$ . For  $\gamma$ , the OLS estimates suffer from the endogeneity of Syrian location decisions, which are likely correlated with the unobservable variables. Because of this, the distance between the Syrian governorate from which the Syrian is fleeing and each potential Turkish provincial destination was used as an instrument. Therefore, there are 81 Turkish provinces\*13 Syrian governorate pairs. Thus, the instrument is calculated as:

$$IV_{pt} = \sum_s \frac{1}{T_{sp}} \theta_s P_t \quad (4.5)$$

where  $s$  denotes the governorate in Syria,  $P_t$  is the total number of registered Syrians in Türkiye in year  $t$ ,  $\theta_s$  is the fraction of Syrians that came from each Syrian governorate in 2015, and  $T_{sp}$  is the distance between the province in Türkiye and the Syrian governorate.

## 4.5 Results

### 4.5.1 Difference-in-Difference Analysis Results

This section presents the baseline estimates from the four different econometric approaches. The coefficients in Table 4.4 show the Syrian influx's impact on the rates of incarceration in the treatment area in comparison to the control area during the period between 2010 and 2015. The analysis was performed using the DiD method. The dependent variable is the logarithm of the proportion of incarceration per thousand residents.

Firstly, to ensure the validity of Difference-in-Differences (DID) estimation, it is crucial to evaluate the common trend assumption, also known as the parallel path assumption. The STATA command "didq," developed by Mora and Reggio (2015), was employed to conduct the parallel-trend test. This test calculates the null hypothesis of parallel paths using auxiliary regressions, where the treatment dummy interacts with year dummies. A rejection of this test would indicate a violation of the parallel path assumption.

The p-values for the common trends test can be found in Table 4.3. After analyzing the regressions, sufficient evidence to reject the null hypothesis of common trends was not. Hence, the observations exhibit parallel paths.

Table 4.3: Testing Common Trends Assumption (p-values).

|                                          | The ratio of<br>incarceration (log) |
|------------------------------------------|-------------------------------------|
| Assault                                  | 0.9045                              |
| Theft                                    | 0.7951                              |
| Homicide                                 | 0.4807                              |
| Non-income generating incarceration rate | 0.966                               |
| Income-generating incarceration rate     | 0.8847                              |
| Total incarceration rate                 | 0.9377                              |

Source: Authors' calculations using a data set that comes from data that was used for the essay.

Two different estimation approaches were applied for the DiD method, according to the weight of the regression. First, Model 1 was constructed without the weights and with robust standard errors. The findings show that the influx of Syrians into the treatment area in Türkiye did not have a statistically significant effect on the rates of incarceration when compared to the control area, while assault had a negative coefficient ( $p$ -value 0.040). As in the Tumen (2016) study, all regression models,

except homicide, have an R-squared over 0.9, which suggests that all the control variables can collectively explain the variance of dependent variables. Though most homicide regressions have a lower R-squared value than other regressions, the R-squared varied between 0.79 and 0.95. All six incarceration rates, including different crime types, had low t-values (the highest was 2.07, for assault), and almost all the coefficients were insignificant at usual levels while their p-values were usually higher than 0.2. For instance, the p-values of the total incarceration rate were 0.283 and 0.641 for Model 1 and Model 2, respectively.

Furthermore, survey weighting is useful when estimating causal effects. If the sample is exogenous and the model is correctly defined, OLS and WLS are used to estimate the consistent regression coefficients (Solon et al. 2015). Thus, WLS was conducted using the total population of each province as the weighting tool. Model 2 reports WLS estimates with robust standard errors. This framework supported the findings estimated with OLS, demonstrating that the influx of Syrians into the treatment area did not significantly affect the rate of criminal activity in that area when compared to the control area. Cluster models were executed, that is, standard errors are clustered with respect to the province, and the total population of each province is used as a weight. Also, the same analysis was conducted without weight, which found consistent results, illustrated in Table 4.4. In these calculations, the standard errors are clustered with respect to each province, and the total population of each province is used as a weight. These different weighting approaches yielded similar results.<sup>33</sup> As for the assault, the estimation result was similar to those in Model 1. Furthermore, the R-squared values ranged from 0.88 to 0.97.

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<sup>11</sup> The robustness of the findings was analyzed by confirming the accuracy of the control group by reanalyzing the same regressions—treating 2012, 2013, 2014, and 2015 as separate post-Syrian periods. Moreover, to confirm the accuracy of the control group, two additional control groups were created: all provinces in Türkiye except for the main treatment provinces, and all provinces in Türkiye except for the main treatment and control provinces. All the robust effects were calculated as consistent with the baseline analysis results.

Table 4.4: Results of the Impact of Syrian Influx on Incarceration Rates (2010–2015).

| <u>Incarceration Rates</u> | <u>Model 1</u>      | <u>R<sup>2</sup></u> | <u>Observations</u> | <u>Model 2</u>      | <u>R<sup>2</sup></u> | <u>Observations</u> |
|----------------------------|---------------------|----------------------|---------------------|---------------------|----------------------|---------------------|
| Assault                    | -0.240**<br>(0.116) | 0.95                 | 174                 | -0.164**<br>(0.077) | 0.97                 | 174                 |
| Theft                      | -0.020<br>(0.121)   | 0.95                 | 173                 | -0.068<br>(0.081)   | 0.97                 | 173                 |
| Homicide                   | -0.126<br>(0.139)   | 0.79                 | 172                 | -0.035<br>(0.112)   | 0.88                 | 172                 |
| Non-income generating      | -0.124<br>(0.138)   | 0.93                 | 174                 | -0.117<br>(0.112)   | 0.95                 | 174                 |
| Income-generating          | -0.079<br>(0.113)   | 0.94                 | 174                 | 0.037<br>(0.099)    | 0.96                 | 174                 |
| Total incarceration rate   | -0.123<br>(0.114)   | 0.93                 | 174                 | -0.039<br>(0.084)   | 0.96                 | 174                 |

*Notes:* All models include control variables: employment rate, housing price, the proportion of lawyers, the proportion of participants in Quran courses, real GDP per capita, high school degree or lower, and higher degree than high school diploma per thousand residents, as well as year and city dummies. Model 1 is conducted without weights but with clustered robust standard errors. Model 2 is conducted with clustered robust standard errors and weight tools. Cluster models with and without the weights were performed and obtained similar results in Table 4.4. Standard errors are clustered by the total population of each city. \*\*\* $p < 0.01$ , \*\*  $p < 0.05$  and \* $p < 0.1$ .

## 4.6 Robustness Checks

### 4.6.1 Panel Event Study Results

Before discussing the synthetic control method results, we first must mention the Panel Event Study (PES) findings. The PES results are consistent with the DiD findings. Leads and lags plotted in Figure 4.1 are considered relative to the event of interest. The reference period is determined at -1 and the period immediately preceding the event's acceptance in each region. Since there was only one event year in this essay, 2012 is the reference year. The results mostly show that the Syrian inflow did not statistically alter the incarceration rates. For instance, for total crime lag1 is 0.131 (0.119), and for theft is -0.021 (0.090), indicating that it is not significant at usual levels.

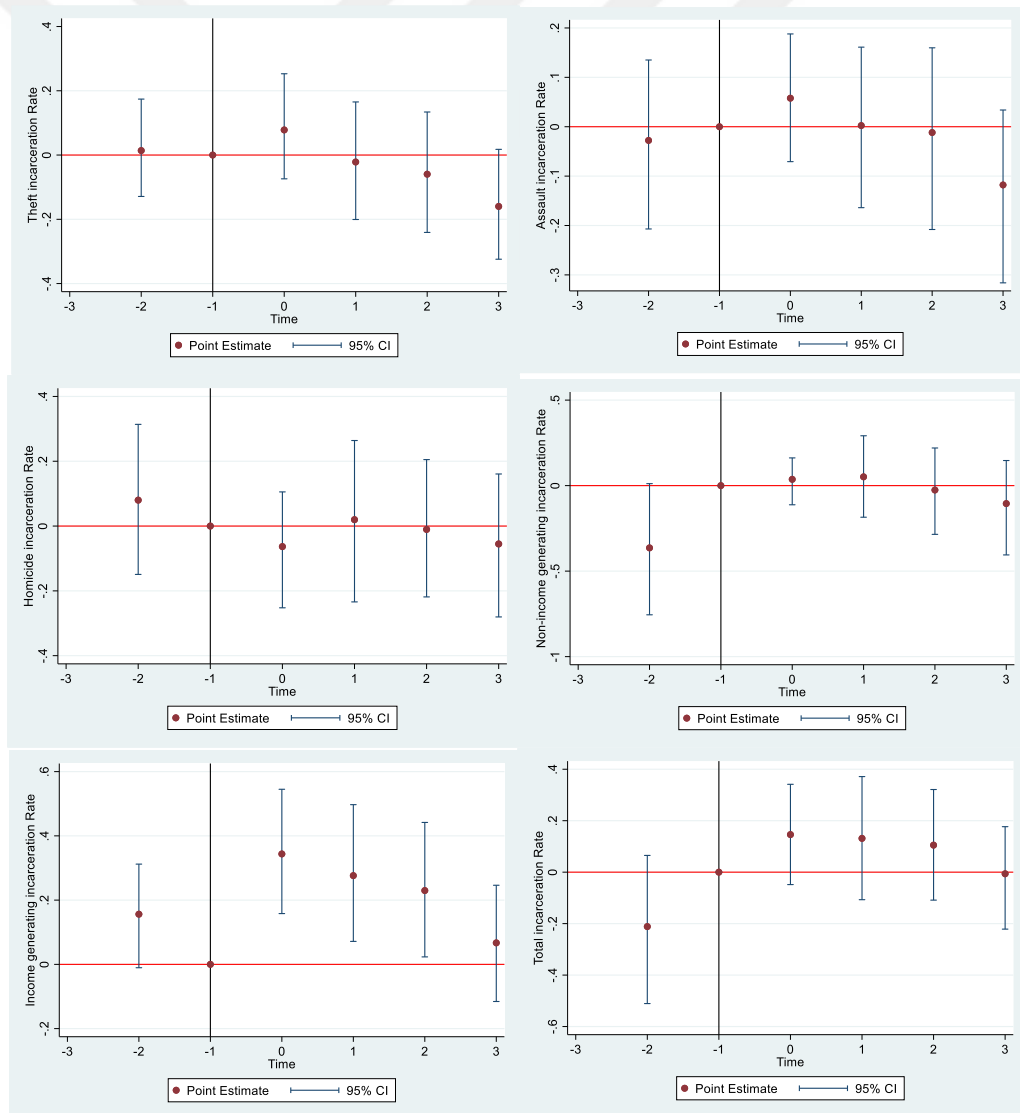


Figure 4.1: Panel Event Study for Incarceration Rates (2010-2015).

#### **4.6.2 Synthetic Control Method Analysis Results**

The DiD method that was utilized for the analysis up to now provides a comparison between the treated and control areas across time and space. In some situations such as having a small number of clusters (e.g., regions, municipalities, or individuals) induce inconsistent standard errors (Angrist and Pischke, 2008) or create a comparison group that may not represent as much as desired. Therefore, a growing number of studies suggest that the SCM might be used as an alternative. Moreover, provinces using treatment and control regions are selected in the light of previous studies that are conducted as NUTS2, which may lead to provinces having different crime rates than treatment cities. Thus, the SCM was carried out, exploiting the advantages of crime data based on province to verify the accuracy of the treatment region.

This part of the essay discusses the findings obtained from the SCM between 2006 and 2015. These years were utilized because the SCM provides better results when keeping the pretreatment year periods longer (Abadie et al., 2015). The SCM is conducted for five provinces that have the highest Syrian-to-native population ratio: Kilis (39%), Hatay (13%), Gaziantep (13%), Sanliurfa (10%), and Mardin (9%). After conducting this preliminary SCM, the treatment was reassigned to the regions that were not affected by the migration wave from Syria. Thus, synthetic counterfactuals, creating a donor pool from up to 67 provinces were conducted. Subsequently, the difference between each actual province and their synthetic counterparts was computed, before plotting all these difference-time series together to identify whether these cities stood out. If this often introduces estimated effects of a similar magnitude to those from the DiD estimation, then we will gain confidence that the estimated effects for the five provinces are not due to the influx of Syrians. Figure 4.2 shows the trends in total crime rates per thousand residents for five cities separately and their synthetic counterparts. The synthetic control regions follow these five cities after the first Syrian influx in Türkiye in 2012.

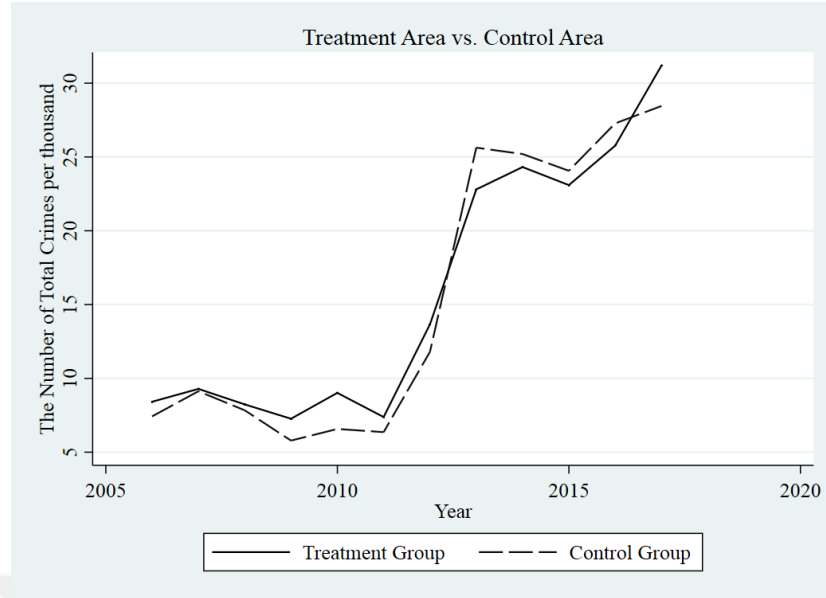


Figure 4.2: The Number of Total Crimes

Figure 4.3 shows the trends in the total rates of incarceration for these five cities separately, along with those of their synthetic counterparts. The synthetic control regions follow these five cities after the first influx of Syrians came into Türkiye in 2012. This situation is also valid for other incarceration rates: the income-generating and non-income-generating incarceration rates, as well as the rates of assault, homicide, and theft. This implies that the influx of Syrians into these provinces did not significantly alter the trends in criminal activity when compared to synthetic control.

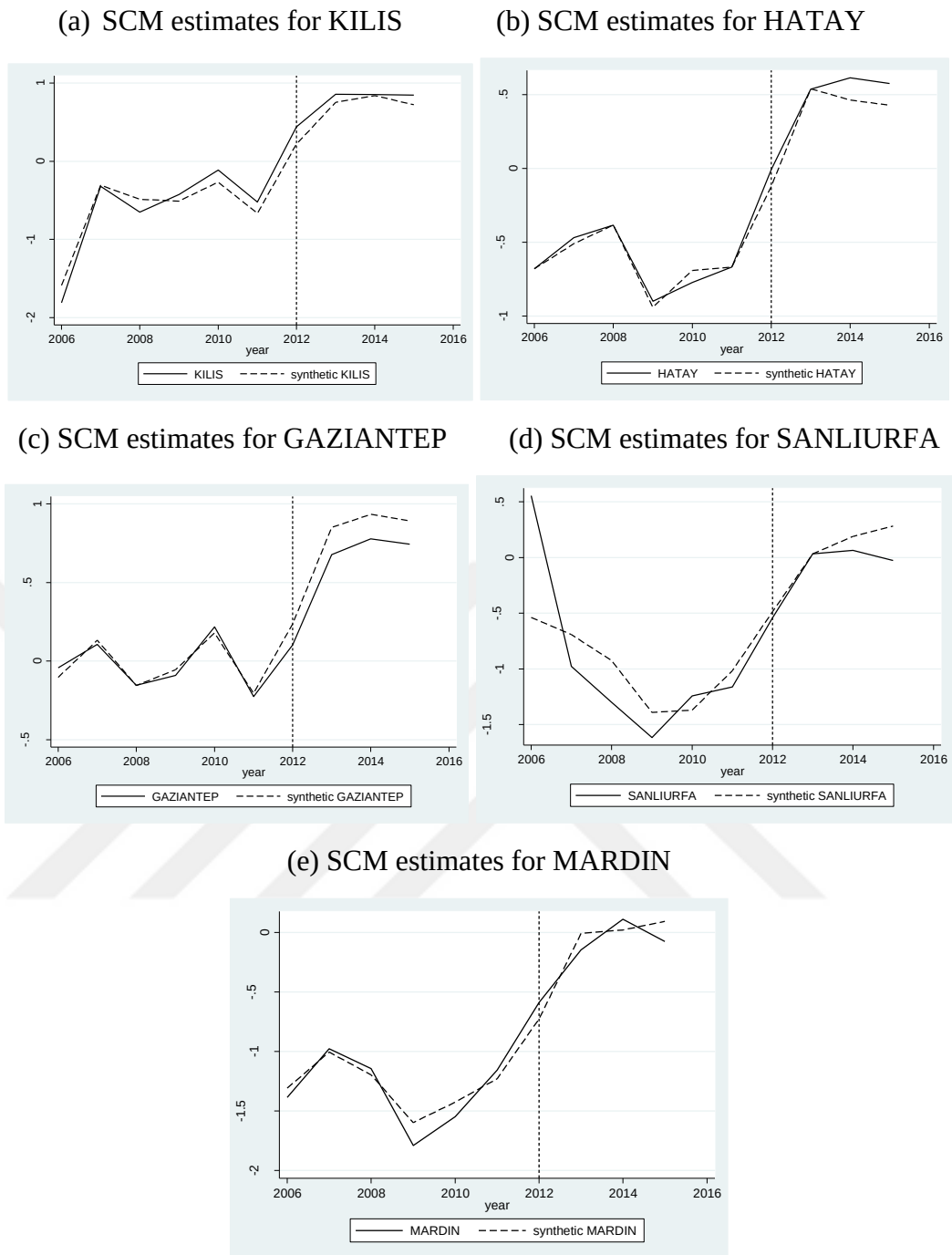


Figure 4.3: Synthetic Control Method Estimates for Total Incarceration Rate (2006–2015).

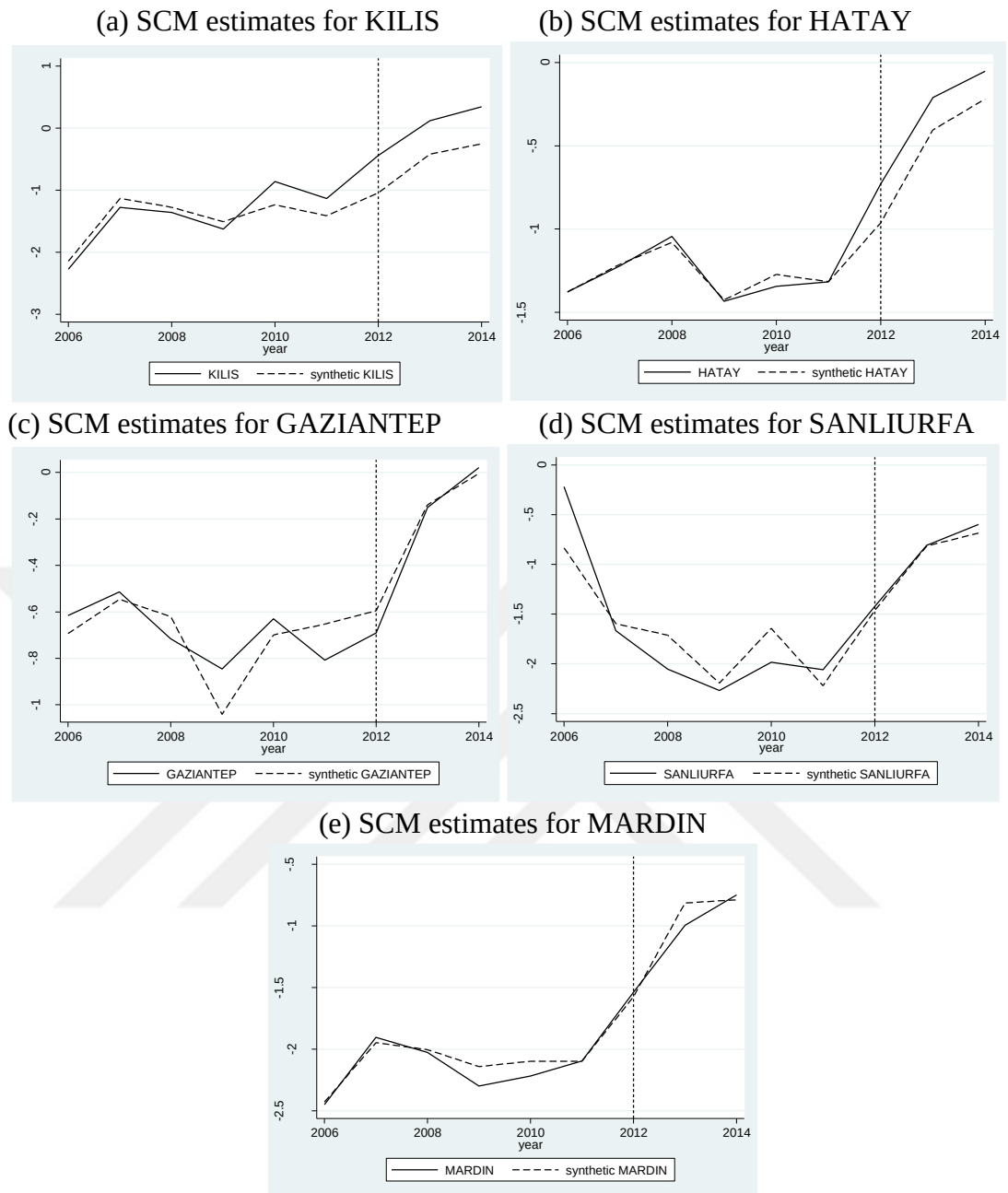
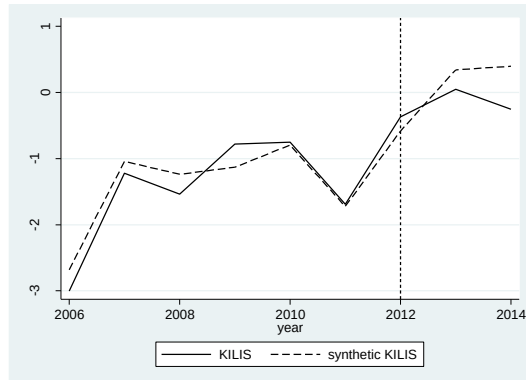
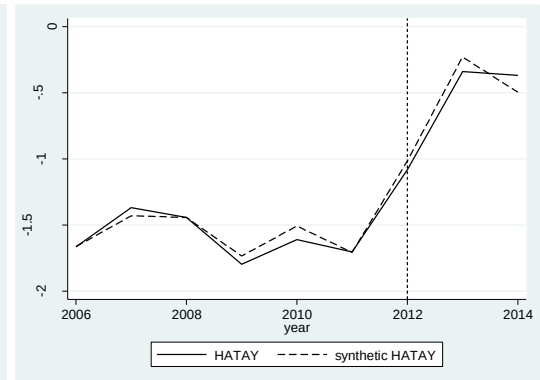


Figure 4.4: Synthetic Control Method Estimates for Income-Generating Crimes (2006-2015).

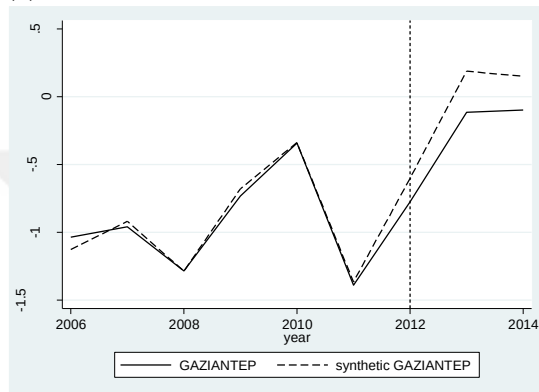
(a) SCM estimates for KILIS



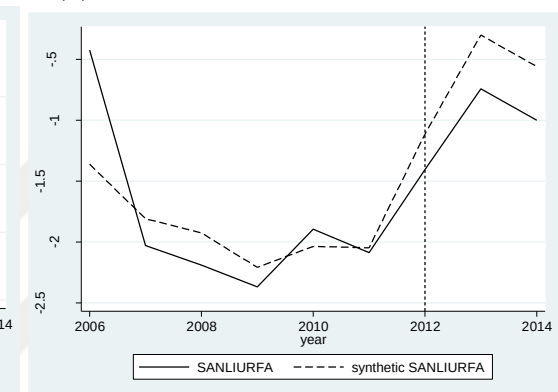
(b) SCM estimates for HATAY



(c) SCM estimates for GAZIANTEP



(d) SCM estimates for SANLIURFA



(e) SCM estimates for MARDIN

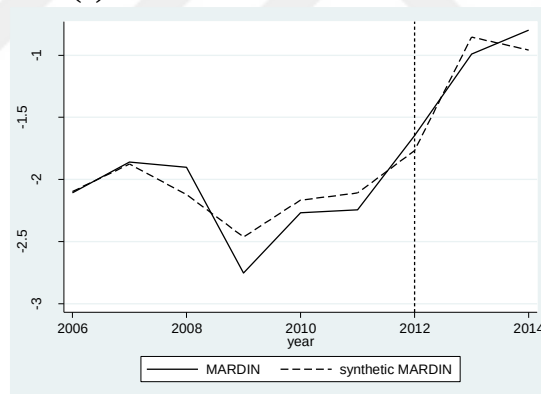
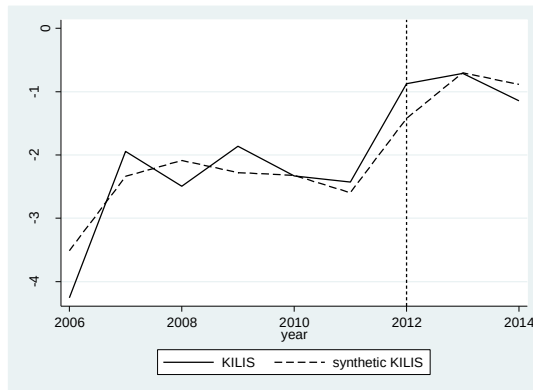
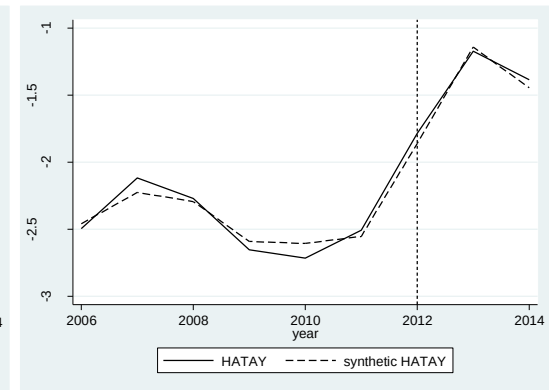


Figure 4.5: Synthetic Control Method Estimates for Non-Income Generating Crimes (2006-2015).

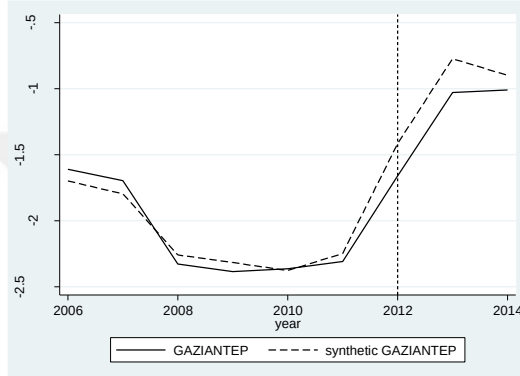
(a) SCM estimates for KILIS



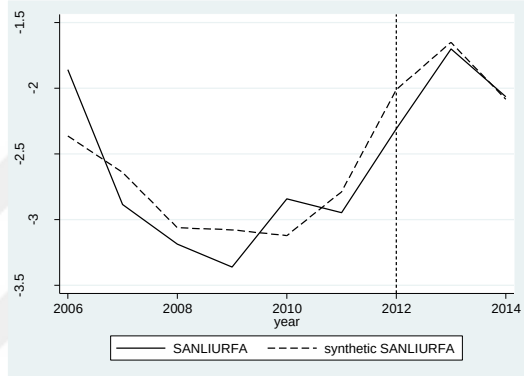
(b) SCM estimates for HATAY



(c) SCM estimates for GAZIANTEP



(d) SCM estimates for SANLIURFA



(e) SCM estimates for MARDIN

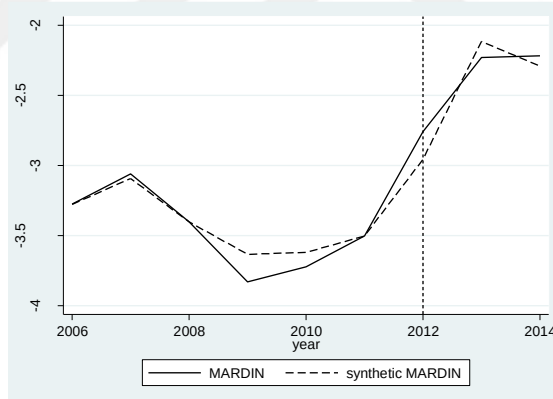
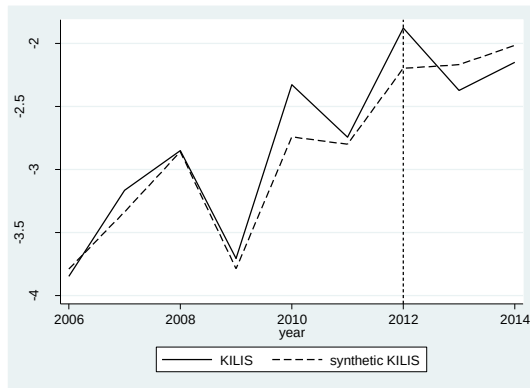
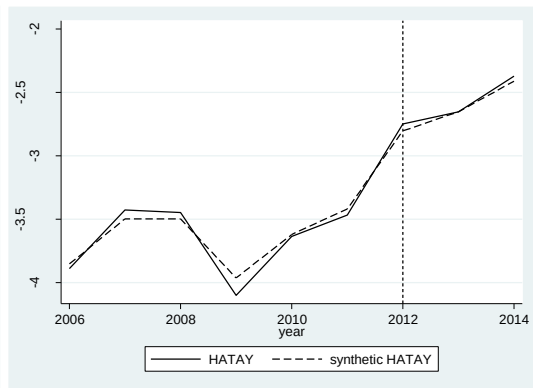


Figure 4.6: Synthetic Control Method Estimates for Assault (2006-2015).

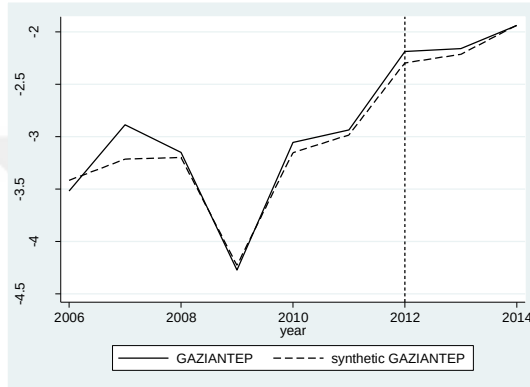
(a) SCM estimates for KILIS



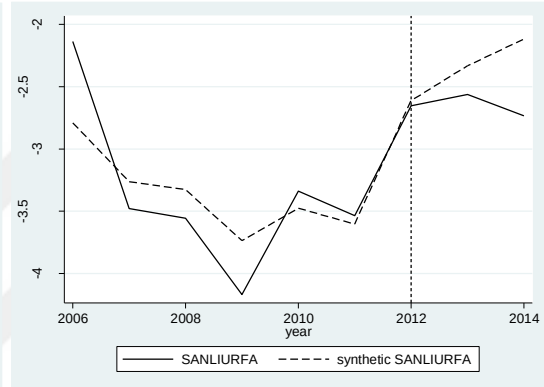
(b) SCM estimates for HATAY



(c) SCM estimates for GAZIANTEP



(d) SCM estimates for SANLIURFA



(e) SCM estimates for MARDIN

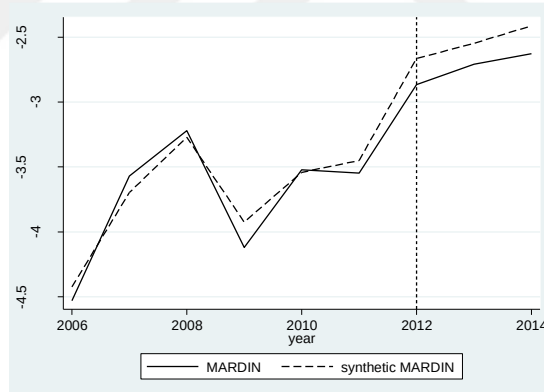
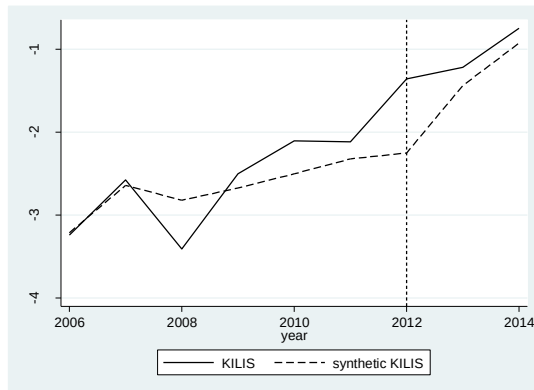
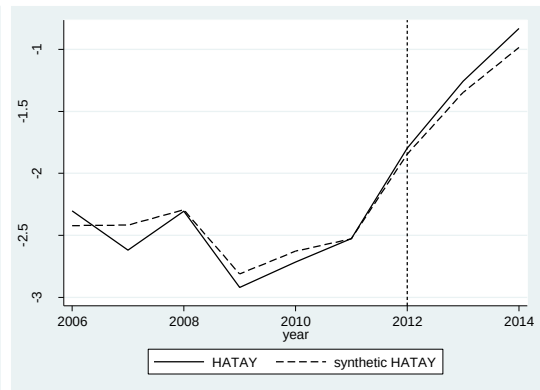


Figure 4.7: Synthetic Control Methods Estimates for Homicide (2006-2015).

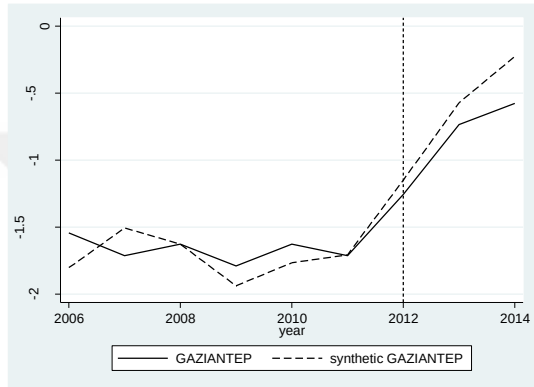
(a) SCM estimates for KILIS



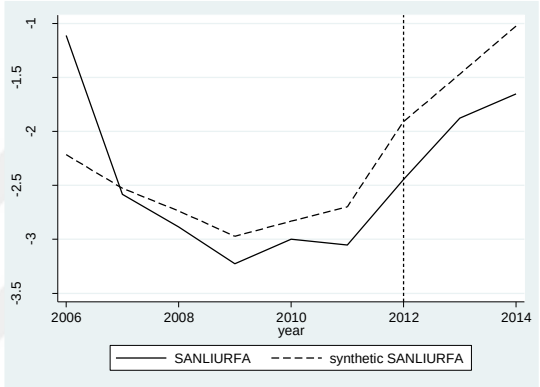
(b) SCM estimates for HATAY



(c) SCM estimates for GAZIANTEP



(d) SCM estimates for SANLIURFA



(e) SCM estimates for MARDIN

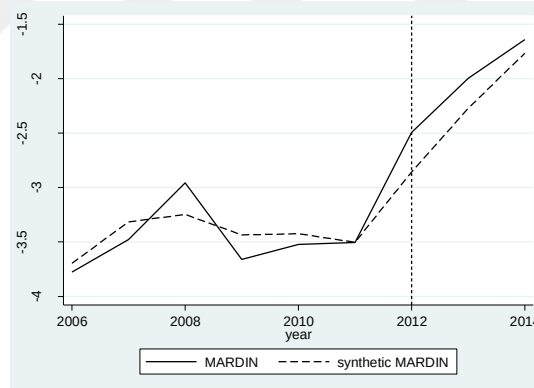


Figure 4.8: Synthetic Control Method Estimates for Theft (2006-2015).

Table 4.5 shows the t-test results for the comparison between the estimates of the synthetic controls and the actual values for the pre-Syrian and post-Syrian periods, separately. It suggests that the standard statistical test results could not reject the null hypothesis of there being parallel trends. For instance, the t-values of the difference between Kilis's total incarceration rates and the estimates from the synthetic province are -0.008 and 0.662 in the pre-Syrian period and post-Syrian period, respectively. This means that the synthetic province is a good control group and the effect of the influx of Syrians on the incarceration rates is not significant, and this is true for all the five cities and all the incarceration rates within those cities. This supports the essay's main findings, which indicate that an increase in the rate of Syrians does not have a statistically significant effect on the host country's incarceration rates.

Table 4.5: Synthetic Control Method t-test Results (2006–2015).

| Incarceration Rate                       | Pre-Syrian  | Post-Syrian |
|------------------------------------------|-------------|-------------|
| Total Incarceration Rate                 | t statistic | t statistic |
| Kilis                                    | -0.008      | 0.662       |
| Hatay                                    | 0.004       | 0.483       |
| Gaziantep                                | 0.030       | -0.667      |
| Sanliurfa                                | 0.092       | -0.549      |
| Mardin                                   | -0.271      | -0.080      |
| Homicide                                 |             |             |
| Kilis                                    | 0.359       | 0.558       |
| Hatay                                    | -0.133      | 0.278       |
| Gaziantep                                | 0.221       | 0.307       |
| Sanliurfa                                | -0.010      | -3.091**    |
| Mardin                                   | -0.128      | -2.769**    |
| Assault                                  |             |             |
| Kilis                                    | -0.068      | -0.365      |
| Hatay                                    | -0.039      | 0.267       |
| Gaziantep                                | 0.001       | -0.645      |
| Sanliurfa                                | -0.017      | -0.967      |
| Mardin                                   | -0.305      | 0.030       |
| Theft                                    |             |             |
| Kilis                                    | 0.145       | 1.013       |
| Hatay                                    | -0.388      | 0.254       |
| Gaziantep                                | 0.792       | -0.925      |
| Sanliurfa                                | 0.061       | -1.874      |
| Mardin                                   | -0.350      | 0.472       |
| Non-income generating incarceration rate |             |             |
| Kilis                                    | -0.140      | -1.121      |
| Hatay                                    | -0.193      | 0.188       |
| Gaziantep                                | -0.023      | -0.906      |
| Sanliurfa                                | 0.210       | -1.75       |
| Mardin                                   | -0.332      | 0.027       |
| Income-generating incarceration rate     |             |             |
| Kilis                                    | 0.115       | 2.065       |
| Hatay                                    | -0.121      | 0.743       |
| Gaziantep                                | 0.238       | -0.172      |
| Sanliurfa                                | -0.023      | 0.095       |
| Mardin                                   | -0.432      | -0.170      |

### 4.6.3 Instrumental Variable Analysis Results

This table presents the results of an essay on the impact of the influx of Syrians on the incarceration rates in Türkiye from 2010 to 2015. The essay uses two different estimation methods: Ordinary Least Squares (OLS) and Instrumental Variables (IV) regression.

Before proceeding to the IV results, it is important to discuss the outcomes of certain test statistics. Following the approach of Staiger and Stock (1997), an instrument is considered to be valid if its F-statistic exceeds 10, indicating its strength. The analysis demonstrates that the F-statistics for all the samples examined surpass this threshold, confirming the instrument's high validity based on the first stage statistics results. Additionally, the endogeneity test statistic indicates that variables in the essay are influenced by endogeneity. Hence, it is crucial to utilize instrumental variable (IV) techniques to obtain accurate and unbiased estimates.

The results in Panel A show the OLS estimates of the impact of the Syrian population on different types of incarceration rates. The coefficient estimates indicate that an increase in the proportion of Syrians in a city is associated with a small increase in the assault incarceration rate (0.047), but a decrease in the theft incarceration rate (-0.029\*\*), and no significant impact on the homicide or total incarceration rates. The non-income-generating incarceration rate and income-generating incarceration rate both increase slightly with an increase in the Syrian population, with coefficients of 0.016 and 0.017, respectively. However, the coefficient for the total incarceration rate is statistically significant and positive at 0.025\*\*.

Panel B presents the IV estimates. The results show that the impact of Syrians on the incarceration rate varies depending on the type of crime. The Syrian population has a positive impact on the assault incarceration rate (0.616) and the income-generating incarceration rate (0.773), but a negative impact on the homicide incarceration rate (-0.935). The non-income generating incarceration rate is negatively impacted by the Syrian population (-0.171). The coefficient for the total incarceration rate is negative and statistically significant at -0.411.

Overall, the results suggest that the impact of Syrians on the incarceration rate in Türkiye is complex and varies depending on the type of crime and the estimation method used. While the OLS estimates show a small positive impact of the Syrian

population on the total incarceration rate, the IV estimates indicate a negative impact. It is important to note that the essay only covers a limited period of time and does not account for other potential factors that may impact the incarceration rate. Therefore, caution is needed when interpreting the results.



Table 4.6: Impact of Syrian Influx on Incarceration Rate, OLS and IV Estimates (2010-2015).

|                        | Assault          | Theft               | Homicide          | Non-income<br>generating<br>incarceration<br>rate | Income<br>generating<br>incarceration rate | Total<br>incarceration rate |
|------------------------|------------------|---------------------|-------------------|---------------------------------------------------|--------------------------------------------|-----------------------------|
| Panel A: OLS Estimates |                  |                     |                   |                                                   |                                            |                             |
| Syrian/Pop             | 0.047<br>(0.030) | -0.029**<br>(0.013) | -0.005<br>(0.037) | 0.016<br>(0.022)                                  | 0.017<br>(0.014)                           | 0.025**<br>(0.011)          |
| Panel B: IV Estimates  |                  |                     |                   |                                                   |                                            |                             |
| Syrian/Pop             | 0.616<br>(1.026) | 0.282<br>(0.737)    | -0.935<br>(1.256) | -0.171<br>(0.668)                                 | 0.773<br>(1.146)                           | -0.411<br>(0.677)           |
| F statistics           | 15.31            | 14.27               | 12.11             | 17.13                                             | 16.27                                      | 18.41                       |
| Endogeneity            | 1.016***         | 0.455***            | 1.210***          | 0.220***                                          | 4.257***                                   | 1.396***                    |
| Test-Statistics        |                  |                     |                   |                                                   |                                            |                             |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: Standard errors are in parentheses. The dependent variable is the logarithm of the proportion of those incarcerated per thousand residents. The number of observations is 243 in all regression models. All models include control variables: employment rate and housing price; the proportion of lawyers, participants in Quran courses, real GDP per capita, high school degree or lower, and higher degree than high school diploma per thousand residents; and year and city dummies.

## 4.7 Conclusion and Discussion

Both internal and international migration are activities that have long-lasting effects on population dynamics. Such migrations are associated with many social, political, and economic challenges for both the origin and destination communities. Unfortunately, when faced with these challenges, migrant communities often face negative attitudes provoked by hate speech and deliberately falsified information, which exasperates and reinforces existing prejudices. Competition for jobs, biases concerning social welfare spending, and suggestions of a supposed increase in crime rates are among the most prominent themes taken up by those who oppose immigration (Baerg et al., 2018; Bordeau, 2009). Despite a lack of reliable evidence to support them, the claims of a linkage between crime rates and immigration levels are popular, especially in times of political or economic hardship. This essay is the first comprehensive attempt to analyze the relationship between incarceration rates and the influx of Syrians into Türkiye. The analysis of these phenomena was conducted based on three different econometric approaches: the DiD, SCM, and IV approaches, depending on a natural experiment. Overall, we fail to reject the null hypothesis and conclude that the regression coefficients are not statistically different from zero in all models, in other words, Syrians do not affect incarceration rates in Türkiye.

The DiD approach that depends on a natural experiment was applied, using the Syrian influx into Türkiye in 2012. The results are based on statistics from Turkish penal institutions for the period 2009 to 2015. The estimates suggest that the Syrians did not statistically increase the crime rates in Türkiye. Throughout the essay, various robustness exercises were applied and those are similar to the main findings. The estimates for homicide either have very low t-values or negative coefficients with high t-values. It is important because anti-immigrant sentiments usually depend on immigrants committing heinous crimes like murder or rape rather than small misdemeanors, for instance, President Trump once said: "Over the years, thousands of Americans have been brutally killed by those who illegally entered our country and thousands more lives will be lost if we don't act right now".

The results demonstrate that the inflow of Syrians did not exert a statistically significant effect on the total incarceration rates in Türkiye during this time period. These results confirm those of Gehrsitz and Ungerer (2022), which also used a natural

experiment and found no association between an increase in the inflow of Syrians and an increase in the aggregate crime rate for counties in Germany between 2014 and 2015. These results are also in line with those from Amuedo-Dorantes et al. (2018), which documented a statistically insignificant evidentiary link between the amount of refugee settlement and local crime rates and terrorist events in the United States for the years between 2006 and 2014. On the other hand, the findings of the present essay contradict the results of Dehos (2017). Using a shift-share instrument, Dehos (2017) showed that an increase in the share of recognized Syrians in Germany between 2010 and 2015 was positively and significantly associated with an increase in the overall crime rate there.

Furthermore, the sign of the coefficients for the income and non-income-generating incarceration rate categories are consistent with the notion that asylum seekers resort to crime when there are barriers to labor market integration (e.g., Bell et al., 2013; Butcher and Piehl, 1998; Spenkuch, 2014). Bell et al. (2013) demonstrated that a small but significant relationship exists between the level of immigration and the rates of property crime in the United Kingdom, and they linked this result to a relative increase in the asylum seekers' propensity to commit property crimes when faced with few job opportunities in their new country. Conversely, in the essay, neither the unweighted nor the weighted models revealed a significant relationship between the amount of the influx of Syrians and the rate of the income and non-income-generating incarceration rate in Türkiye. The ability of Syrians to find jobs in the informal market in Türkiye (Altindag et al., 2020) might play a role in this result. Indeed, research has shown that when asylum seekers have better labor market opportunities, there is a reduction in the rate of their criminal activity (e.g., Couttenier et al., 2016).

Echoing the results of Light and Miller (2018), this essay shows that the rate of assault is significantly and negatively correlated with the rate of immigration in the unweighted model. However, the relationship is not significant in the weighted model. Also, as is evident from both models, the results do not indicate that an increase in the immigrant population is associated with an increase in the rates of theft or homicide. In addition, the estimates for homicide have either very low t-values or negative coefficients with high t-values. This is important because anti-immigrant sentiments usually depend on the claim that immigrants are committing heinous crimes, such as

murder or rape, rather than small misdemeanors (Getmansky et al., 2018). The essay's findings show that such claims are unfounded.

Although the findings might help clarify the contradictory results in the literature about the effects of immigrants on crime rates thanks to the econometric advantages of the natural experiment, the essay still has some shortcomings. For example, the misreporting of crimes may cause estimation problems, that is, the failure of individuals to report crimes they experienced to the police may lead to lower incarceration rates. The Life Satisfaction Survey (LSS) of TurkStat, which is the micro dataset, contains one question regarding the reporting of crimes. Based on the responses to this question, in 2012, 29.4% of individuals did not report assaults they experienced that year. When respondents were asked why they did not report the crime to the security forces, 40% of them said that they did not think it would lead to any results, which is the most common answer among the respondents. In 2016-LSS, 57% of respondents did not report assaults, and 70.2% of them thought that they did not have any results. Thus, this failure to report crime may lead to the underestimation of the impact of the Syrian influx on crime rates in Türkiye. However, the homicide rate, which is consistent with the essay's main conclusion, is very unlikely to suffer from the underreporting problem, which supports the essay's conclusion.

It is worth noting that almost 3.7 million Syrians live in Türkiye of which the population is around 82 million. The results strongly suggest the crime trends in Türkiye did not change by Syrians. It demonstrates how unfounded the concerns about immigrants are on the crime issue. Even though the results are robust, and several previous studies found similar findings; for example, the natives have higher rates of institutionalization compared with immigrants (e.g., Butcher and Piehl, 2007), given the contentiousness of the debate, more research on the long-term effects of immigration on crime rates might still be necessary.

The essay demonstrates that the trends for the incarceration rates in Türkiye did not change because of the influx of Syrians from 2011 onward. This result discredits baseless concerns regarding any increase in crime rates because of this influx of Syrians. This finding is of great importance not only for research on immigration and crime but also for those making policy and for the general public interest. National and local authorities might consider using the results of the essay to strengthen social cohesion between displaced peoples and host community members, while also attempting to ameliorate xenophobic attitudes.

## 5 GENERAL CONCLUSIONS AND DISCUSSIONS

The three essays of this thesis explore the effects of various work conditions on the health of older workers, the impact of Syrians on job vacancy rates and job-finding rates in Türkiye, and the impact of the Syrian influx on the incarceration rate in Türkiye. In general, the thesis contributes to the literature on the impact of immigration on various aspects of the host countries, including the labor market and the criminal justice system. Findings obtained from these essays have important policy implications, particularly for countries that are experiencing an influx of refugees or immigrants. This thesis provides insight into how policymakers can design policies and interventions that ensure healthy late life and maintain a productive workforce, improve labor market conditions for both immigrants and natives, and promote social cohesion. This section of the thesis summarizes the key findings discussed in the preceding essays and outlines their policy implications. It also acknowledges the limitations of the analytical approach and offers suggestions for future research in this area. Finally, the section concludes the thesis by bringing together the main points.

When considering the global perspective, older immigrants contribute significantly to the labor force of many countries. They often fill essential roles in industries with labor shortages, such as healthcare, agriculture, and construction. Understanding the working conditions and mortality rates among older immigrant workers is crucial for ensuring their well-being, protecting their rights, and promoting healthy aging. It can also help inform policies related to labor rights, occupational safety, and healthcare access. In the case of the United States, immigrants make up a substantial portion of the workforce, including older adults. Analyzing the working hours and mortality rates of older immigrant individuals in the U.S. is important for multiple reasons. Firstly, it sheds light on the occupational health and safety of this population, addressing concerns such as workplace hazards, job insecurity, and wage disparities. Secondly, it helps policymakers and healthcare providers develop targeted interventions and services to improve the health outcomes and quality of life for older immigrant workers. Lastly, considering the economic impact, understanding the relationship between working hours and mortality can have implications for retirement policies, social security programs, and labor market dynamics. Overall, examining the

working hours and mortality rates among older immigrant individuals is crucial for safeguarding their well-being, ensuring fair working conditions, and optimizing the economic contributions of this population. In this respect, the first essay fills an important gap in the literature by investigating the relationship between long working hours (LWH) and mortality among older populations. The results of this essay did not find a significant association between working 50 h/week or more and all-cause mortality for older workers in the US. This research extended the findings of earlier research by taking into consideration the potential impact of many demographic, socioeconomic, work-related, and health-related factors.

The essay has important strengths, including a randomly selected sample, variables related to personal health, and information on both main jobs and subsidiary occupations. However, the essay's limitations include the self-reported nature of variables, the exclusion of institutionalized adults, and the lack of information on youth. Although the essay did not find a significant association between LWH and mortality, the need for work time directives and precautionary measures for older adults' health should not be ignored. The essay recommends further research on a wider age span, data from different countries, and specific sectors and occupations. According to the findings, it is important to understand the specific work conditions that affect older workers' health to design policies and interventions that ensure healthy late life and maintain a productive workforce. For example, policies could be implemented to reduce physical demands on older workers, such as by providing lifting aids or modifying work tasks (NIOSH, 2019). Interventions could also be designed to reduce exposure to workplace hazards, such as by improving ventilation or using personal protective equipment (Tamers et al., 2019). Psychosocial stressors could be addressed through workplace interventions such as training programs to improve job control and reduce interpersonal conflict (Lamontagne et al., 2007). In addition to improving the health and well-being of older workers, addressing work conditions that affect their health can also have economic benefits. For example, reducing the physical demands of work could help prevent musculoskeletal injuries and reduce absenteeism and healthcare costs (Von Den Berg et al., 2017). Moreover, creating a healthy work environment for older workers could help them retain their skills and experience, which are valuable assets to employers (Von Bonsdorff et al., 2012).

These implications can guide policymakers in designing targeted interventions and policies to promote the well-being and productivity of older immigrant workers.

**Promoting work-life balance:** it is still essential to prioritize work-life balance and ensure that older immigrants have opportunities for adequate rest and leisure. Policymakers should encourage employers to provide flexible working arrangements, such as reduced hours or part-time options, to support the well-being of older immigrant workers (ILO, 2022).

**Occupational safety and health:** While long working hours may not directly contribute to increased mortality risk among older immigrants, attention must be given to ensuring safe and healthy working conditions. Policies should focus on improving occupational safety regulations, training programs, and monitoring systems to minimize workplace hazards and prevent health-related issues associated with specific occupations (Castañeda, et al., 2015).

**Access to healthcare services:** Although the essay did not find a significant association between LWH and mortality, it is crucial to address healthcare disparities among older immigrant workers. Policies should aim to enhance access to affordable and culturally sensitive healthcare services, including regular health check-ups, preventive care, and chronic disease management (World Health Organization, 2019). This can contribute to the overall well-being and longevity of older immigrant workers. Moreover, immigrant older adults may face unique challenges related to language barriers, cultural adaptation, and social isolation. Policies should promote social integration and provide support networks for older immigrants in the workforce. This can include language and vocational training programs, community outreach initiatives, and intergenerational activities to foster social connections and reduce isolation (OECD, 2018b). Plus, creating age-friendly work environments is crucial for older immigrant workers to thrive. Policies should encourage employers to implement age-inclusive practices, such as job redesign, training opportunities, and mentorship programs. This can enable older immigrants to remain engaged, productive, and valued members of the workforce (OECD, 2020).

Understanding the impact of immigration on the labor market outcomes of native workers is especially important in the current global context, where immigration has become a highly politicized issue. Anti-immigrant sentiments are on the rise in many countries, and policymakers need to make informed decisions based on sound evidence to address the concerns of both natives and immigrants. In this regard, findings obtained from the second essay help policymakers to design effective policies and

interventions that improve labor market conditions for both immigrants and natives. In this essay, the impact of the Syrian influx on the job vacancy rates and job-finding rates in Türkiye was examined. The results of the essay suggested that the JVR and JFR in the treatment area diminished because of the Syrian inflows. This reduction in JFR indicates that the Beveridge curve shifted inwards, thereby raising matching efficiency and facilitating an improvement in labor market conditions. The findings of this research contribute to the literature by providing insight into how immigrants affect the efficiency of the labor market which is essential for policy design and implementation.

Finally, the essay highlights the need for future research to integrate immigration into the Beveridge curve theoretical framework. According to findings, one way to improve labor market conditions for both immigrants and natives is to design policies that promote the integration of immigrants into the labor market. Immigrants often face barriers to entry into the labor market, such as language barriers, discrimination, and lack of recognition of their foreign credentials (OECD, 2015; Demirci and Kırdar, 2023). Policies that address these barriers can not only improve labor market outcomes for immigrants but also benefit native workers by expanding the pool of available workers and potentially increasing productivity (Borjas, 2003). Another way to improve labor market conditions for both immigrants and natives is to design policies that ensure a level playing field in the labor market. For example, policies that prevent discrimination based on nationality or ethnicity can improve the labor market outcomes of immigrants and reduce the negative impact of immigration on native workers' wages (Card, 1990). Similarly, policies that promote the enforcement of labor standards can ensure that immigrants are not exploited by employers and that their presence in the labor market does not depress wages for native workers.

The global refugee crisis has brought the issue of the integration of refugees into the public eye. One critical aspect of social cohesion is the impact of refugees on the host country's criminal justice system. Understanding this impact is essential in designing policies and interventions that promote social cohesion. Therefore, in the third essay, the impact of the Syrian influx on the incarceration rate in Türkiye was investigated. The results of this essay suggested that the influx of Syrians from 2011 onwards did not have a statistically significant impact on the incarceration rate when compared to control locations.

Although the essay suggests that the findings help clarify the contradictory results in the literature about the effects of immigrants on crime rates, it also acknowledges some shortcomings, such as the misreporting of crimes. The failure to report crimes may lead to the underestimation of the impact of the Syrian influx on crime rates in Türkiye. However, the homicide rate, which is consistent with the main conclusion, is unlikely to suffer from underreporting. The essay suggests that the concerns about immigrants on the crime issue are unfounded, and authorities could use the results to strengthen social cohesion between displaced peoples and host community members, while also confronting xenophobic attitudes. Therefore, this essay provides evidence that challenges the common belief that refugees or immigrants increase crime rates in the host country.

One critical policy intervention is ensuring that the criminal justice system is accessible and fair to immigrants. Research has shown that immigrants may face challenges in accessing legal services and may be subject to discrimination within the criminal justice system (UNHCR, 2019d). Policies that promote equal access to legal services and address discrimination within the criminal justice system can help promote social cohesion and reduce their risk of involvement in criminal activities. Finally, policies that address the root causes of Syrian displacements, such as conflict, poverty, and discrimination, are essential in promoting social cohesion. These policies may include diplomatic efforts to resolve conflicts, development aid to address poverty, and anti-discrimination policies to address systemic inequalities.

In conclusion, the thesis consists of three essays that explore the impact of various work conditions on the health of older workers in the USA, including older immigrant workers, the effects of Syrian on the labor market in Türkiye, and the impact of the Syrian influx on the incarceration rate in Türkiye. The research contributes to the literature on immigration's impact on the labor market and the criminal justice system. The findings suggest that understanding the specific work conditions that affect older workers' health is crucial in ensuring healthy late life and maintaining a productive workforce, and policies and interventions should be designed to address them. The findings provide insights into how policymakers can design policies and interventions to promote healthy late life, maintain a productive workforce, improve labor market conditions for both immigrants and natives, and promote the social integration of immigrants. Overall, the research highlights the importance of understanding the impact of immigration on various aspects of the host country and

designing policies based on sound evidence to address the concerns of both natives and immigrants.



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