ISTANBUL TECHNICAL UNIVERSITY★ GRADUATE SCHOOL

IMPACTS OF SYRIANS UNDER TEMPORARY PROTECTION ON LOCAL DEVELOPMENT IN TÜRKİYE

M.A. THESIS

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ISTANBUL TEKNİK ÜNİVERSİTESİ ★ LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

GEÇİCİ KORUMA ALTINDAKİ SURİYELİLERİN TÜRKİYE'DEKİ YEREL KALKINMA ÜZERİNDEKİ ETKİLERİ

YÜKSEK LİSANS TEZİ

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MAYIS 2024

Anıl Deniz AKA, an M.A./ student of İTU Graduate School of Arts and Social Sciences student ID 412211003, successfully defended the thesis entitled "IMPACTS OF SYRIANS UNDER TEMPORARY PROTECTION ON LOCAL DEVELOPMENT IN TÜRKİYE", which he prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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Date of Submission : 29 June 2024
Date of Defense : 05 July 2024

To my family and my deceased father,

FOREWORD

My pursuit of this thesis along with my M.A. in Economics has given me the opportunity to view the world in a new light. I have improved my analytical abilities via this education, which has allowed me to view both local and global events in new ways. I am appreciative of the chance to advance both society and my own development.

I would like to express my deepest gratitude to my adviser, Assoc. Prof. Dr. Ayşegül Kayaoğlu Yılmaz, for all of her support and guidance throughout my M.A. thesis.

In addition, I would like to express my sincere gratitude to my father, Sezer, who sadly died away in 2023 after working tirelessly to bring me a better life, and to my mother, Nezahat, who has supported me every step of the way. My appreciation also goes to my life partner, Zuhal, for her unwavering support through all challenges, and to my brother, Utku. Lastly, I am thankful to all my teachers and colleagues who have supported and encouraged me in my endeavors.

May 2024 Anıl Deniz AKA

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ABBREVIATIONS

SDID	: Synthetic difference-in-differences
DID	: Difference in differences
SCM	: Synthetic Control Method
UNDP	: United Nations Development Programme
HDI	: Human Development Index
IHDI	: Inequality-Adjusted Human Development Index
GDI	: Gender Development Index
GII	: Gender Inequality Index
OCHA	: Office for the Coordination of Humanitarian Affairs
ATT	: Average Treatment on the Treated
IOM	: International Organization for Migration
GDP	: Soil and Water Assessment Tool
SSA	: Sub-Saharan Africa
MEB	: Turkish Ministry of National Education
TURKSTAT	: Turkish Statistical Institute
TÜİK	: Turkish Statistical Institute
WHO	: World Health Organization
EYS	: Expected Years of Schooling
MYS	: Mean Years of Schooling
UNESCO	: United Nations Educational, Scientific and Cultural Organization
GNI	: Gross National Income
UNDESA	: United Nations Department of Economic and Social Affairs
YÖK	: The Council of Higher Education (Turkey)
UN	: United Nations

SYMBOLS

$\hat{\tau}^{e}$	**:** Estimation of the Effect
A_x	**:** Inequality Ratio
ζ	**:** Regularization Parameter
ω	**:** Unit Weights
$\hat{\lambda}_t$	**:** Time Weights
$argmin$	**:** Argument of the Minimum
N	**:** Number of Observations

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IMPACTS OF SYRIAN IMMIGRANTS ON LOCAL DEVELOPMENT IN TURKEY

SUMMARY

Migration has become a major concern for policymakers and researchers since the 2000s, as the number of migrants has been steadily increasing, impacting people in socio-economic ways. The consequences and effects of migration are not limited to the migrants themselves; they also affect those who remain in the migrants' home areas and the residents of more developed countries where the migrants resettle. In the last decade, Turkey has been significantly affected by forced migration, particularly due to its support for Syrians displaced by the Civil War. This research explores how Turkey's local development has been influenced by these refugees. To do so, this study employs a causal identification strategy comparing Development Index scores in provinces hosting higher share of refugees with other provinces before and after 2012, when Syrian refugee influx towards Turkey has started. As local development levels of provinces in both within and across regions of Turkey are distinct from each other, we used alternative ways to construct our counterfactual group of provinces. Therefore, in addition to staggered synthetic difference-in-differences we also used difference-in-differences and synthetic control method to check the robustness of our findings.

To analyze the effects and data, the Synthetic Difference in Differences method is employed. The purpose of this study is to demonstrate how local development, proxied by human development and gender development, is affected by migration. Additionally, this work implicitly examines the impact of migration on other socio-economic parameters, such as GDP per capita and life expectancy, which are included in the calculation of Human Development Index (HDI). The study also compares other indexes, including the Gender Inequality Index (GII), the Gender Development Index (GDI), and the Inequality-adjusted Human Development Index (IHDI), which measure gender and general inequality points.

The results indicate that migrants have positively contributed to the local development, proxied by indices of GDI, GII, and HDI, except for the IHDI. These findings suggest that migrants have had a socio-economic contribution to Turkey between 2009 and 2018. Although Turkey's situation is unique due to the rapid increase in migrants and its provinces' diverse geographical and social characteristics, this thesis can contribute to the literature on whether refugees positively affect local development in destination countries.

GEÇİCİ KORUMA ALTINDAKİ SURİYELİLERİN TÜRKİYE'DEKİ YEREL KALKINMA ÜZERİNDEKİ ETKİLERİ

ÖZET

Göç, 2000'lerden bu yana politikacı ve araştırmacılar için dikkate alınması gereken konu haline gelmiştir. Göçmen sayısı sürekli artmakta ve tüm insanlığı çoğu açıdan etkilemektedir. Göçün sonuçları ve etkileri sadece göçmenlerle olan etki ile sınırlı değildir; aynı zamanda göçmenlerin göç etmeden önceki alanlarda yaşamaya devam eden hane halkını ve göçmenlerin yerleştikleri daha gelişmiş ülkenin sakinlerini de etkiler. Son on yılda, Türkiye özellikle Suriye İç Savaşı nedeniyle yerinden edilen Suriyelilere verdiği destek nedeniyle önemli ölçüde zorunlu göçten etkilenmiştir. Bu araştırma, Türkiye'nin yerel kalkınmasının Suriyeliler tarafından nasıl etkilendiğini araştırmaktadır. Bunun için, Suriyelilerin Türkiye'ye doğru akışının başladığı 2012'den önce ve sonra, yüksek Suriyeli popülasyon barındıran illerdeki Kalkınma Endeksi skorlarını diğer illerle karşılaştıran ekonomi methodları ile analiz edilmek amaçlanmıştır. Literatürde genellikle kullanılan Difference-in-Differences ve Syntethic Control Method'la etkinin analizi yapılsa da doğruluğu daha yüksek olan, bahse konu iki methodun kombinasyonu olan Syntethic Difference in Differences (SDID) methodu ile analizleri yorumlamak amaçlanmıştır.

Etkileri ve verileri analiz etmek için, SDID yöntemi kullanılmaktadır. Bu çalışmanın amacı, yerel kalkınma puanlarının göçmenlerden nasıl etkilendiğini göstermektir. Ayrıca, göçün insan Gelişimi Endeksi (HDI) hesaplamasına dahil edilen kişi başına düşen GSYİH, beklenen yaşam süresi gibi diğer sosyo-ekonomik parametreler üzerindeki etkisini de dolaylı olarak inceler. Çalışma, cinsiyet ve genel eşitsizlik puanlarını ölçen Cinsiyet Eşitsizlik Endeksi (GII), Cinsiyet Gelişimi Endeksi (GDI) ve Eşitsizlik Düzeltilmiş İnsani Gelişim Endeksi (IHDI) gibi diğer endeksleri de karşılaştırmayı amaçlamıştır.

Sonuçlar, göçmenlerin GDI, GII ve HDI endeksleri ile temsil edilen yerel kalkınmaya olumlu katkıda bulunduğunu, ancak IHDI endeksi için sağlıklı bir yorum yapılamayacağını göstermektedir. Bu bulgular, göçmenlerin 2009 ve 2018 yılları arasında Türkiye'ye sosyo-ekonomik katkıda bulunduğunu öne sürmektedir. Türkiye'nin durumu, hızla artan göçmen sayısı ve illerin çeşitli coğrafi ve sosyal özellikleri nedeniyle farklı ülkelerdeki göç algısına göre farklıdır fakat mültecilerin yerel kalkınmaya olumlu etkileri olup olmadığı konusunda literatüre katkı sağlanmıştır.

1. INTRODUCTION – IMMIGRATION, REFUGEES AND DEVELOPMENT

Unexpected events such as natural disasters and wars occurring worldwide force people to flee their places of residence. In such circumstances, individuals seek a place to live, leading to what is termed as 'refugee.' While the migration of refugees is often mandatory, it can be either permanent or temporary (Reyhanoğlu & Akın, 2022). The effects of refugees seeking shelter in another country have become a subject to be taken into consideration by many researchers. According to UNCHR (2021), the population of refugees reached twenty-six million by the end of 2019. As of June 2020, Syria’s nearby countries which are Turkey, Egypt, Iraq, Jordan, and Lebanon hosted a total of 5,543,746 registered Syrian refugees." According to the latest available figures from the Turkish Presidency of Migration Management (PMM) in 2024, there are 3.1 million of Syrians whom are seeking international protection. Effects of Syrian refugees on the Turkish economy has been arguing since Turkey has started to take refugees after the Syrian Civil War. This study aims to explain how Syrian refugees affect the development parameters in Turkey by using Synthetic Difference in Differences method.

Since the concept of development can vary, Pearson’s definition of development, which is considered in this work, provides clarity. Pearson states in 1992 that development implicates an improvement qualitative, quantitative or both aspects of utilizing existing resources. Pearson also states that development cannot be defined with a singular viewpoint regarding social, political and economic progress. Rather than, development explains a combination of approaches aimed at transforming socio-economic and environmental positions from their current state to desired state.

According to Pearson’s definition, development can be considered as the main continuum for all households to increase socio-economic and political parameters. In order to measure development, there are many branches, such as levels of welfare, inequality, and poverty, life expectancy, that are indexed into the one term “development index,” which has to be the main consideration for the policymakers for the macro level in order to try increasing development because policymakers need to increase the households' living standards, ease of access to public services and social safety nets, etc. Therefore, they try to increase it. As proof, Turkey has been publishing a report named SEGE which contains development indices at the provincial level and this report led to consideration of preventing inequality between less and more developed by trying to implement development policies in the former. Accordingly, policy makers try to consider increasing the development scores of less developed areas. Also, there is a global index prepared by the United Nations Development Programme (UNDP) that reflects the development levels and trends between countries and provinces. In this paper, UNDP is taken reference for the analysis.

Development indexes are divided into the categories of low developed regions, medium developed regions, high developed regions and very high developed ones. Highest developed points means that they supply more opportunities, life expectancy is higher, GDP per capita is higher, in summary welfare is higher when compared to less developed ones. Consequently, there is a trend that people who live in less developed countries tend to resettle in more developed countries in order to live in better conditions called "immigration." Immigration has a positive correlation with development for less developed countries until their standard of living equals that of developed countries (Massey et al,1988). Refugee status is considered as a subset of the migration concept, as it entails forced migration (UNHCR, n.d.). Therefore, in this article, by explaining the specific concept of refugee status, the impact of migration will also be elucidated.

1.1 Purpose of Thesis

The purpose of this paper is to explain how immigrants affect development, using Turkey as a reference. Since 2011, a large number of immigrants have been coming to Turkey due to the civil war in Syria, which began in the same year. The civil war in Syria has affected neighboring countries, with many people being forced to flee their homes. According to OCHA's report, sadly, 42 places have experienced a decline in the Human Development Index (HDI). The civil war in Syria has resulted in the internal displacement of 6.8 million people, the largest such displacement in the world since the beginning of the crisis (OCHA, 2022). Both neighboring countries of Syria and the European Union have helped war victims resettle in their countries. Turkey is one of the neighboring countries of Syria. Moreover, the Turkish government has significantly aided Syrian immigrants.

1.2 Scope of Thesis

The aim of this thesis is to investigate the impact of refugees on Turkey's development, contributing to the existing literature on whether immigration significantly affects the Human Development Index (HDI) in areas where immigrants settle. It's important to note the distinction between immigrants and refugees. Refugees are individuals who are forced to relocate to another area due to unforeseen circumstances. However, since Turkey is working towards the permanent integration of Syrian refugees into the country, there may not be a significant difference between refugees and immigrants in this context. Therefore, for the purposes of this paper, Syrian refugees in Turkey are considered as immigrants, as Turkey is striving for their permanent integration into the country. Thus, refugees can be regarded as a subset of immigrants for this study.

1.3 Explanation of Data and Method

This paper delves into the various measurements of development employed by different organizations and the United Nations Development Programme (UNDP) stands out as a prominent publisher of such reports since 1990. In addition to the Human Development Index (HDI), which is a classical measure of development, the UNDP also publishes other indices that capture specific aspects of development, such as the Gender Development Index (GDI), Inequality-adjusted Human Development Index (IHDI), and Gender Inequality Index (GII). These indices offer a nuanced understanding of development by focusing on different dimensions such as gender equality and inequality. Section II of this paper provides detailed explanations of these indices. The primary focus of this paper is to analyze the impact of immigration on various development indices, covering all the indices.

In this paper, the aim is to illustrate the effects of immigration using the average treatment on the treated (ATT) method, highlighting disparities between provinces with significant migrant populations and those without. Given the non-uniform distribution of immigrants across Turkey's provinces, the analysis includes all provinces to showcase the effects of immigration through comparisons. Statistical techniques such as Synthetic Difference-in-Differences (SDID), Synthetic Control Method (SCM), and Difference-in-Differences (DiD) are employed to elucidate these effects.

The Synthetic Difference-in-Differences (SDID) method, which merges the Difference-in-Differences (DiD) and Synthetic Control Method (SCM), is employed in this paper to assess the impact of migration on development. The DiD method assumes parallel trends to gauge the average treatment effect (ATT) on the treated. However, a limitation of the DiD model is its efficiency in comparing only two variables, as it does not include unit weights, making it challenging to find a control group similar to the treatment group in the pre-treatment period. Additionally, the DiD model assumes that in the absence of treatment effects, the groups would follow the same trajectory, which may not always be the case that may lead to biased estimation for the DiD anaylsis (Arkhangelsky et al. 2019).

The other estimation method is the Synthetic Control Method (SCM) that facilitates the calculation of ATT by adjusting different control groups values into a single value same as the treated variable in pre-exposure period. However, the SCM may suffer from overfitting issues since unit weights are assigned to the control group to create equal values between the groups before pre-treatment period.

To address these limitations, the SDID method combines elements of both DiD and SCM to calculate an unbiased ATT. The data for the SDID analysis is sourced from the United Nations Development Programme's (UNDP) Human Development Reports. All three methods - SDID, DiD, and SCM - are utilized to analyze the data comprehensively.

The thesis is structured into six sections. In Section I, an introduction to the thesis statement and its scope is provided, as well as an overview of the literature research. Section II delves into the datasets utilized for the analysis, elucidating any disparities between the datasets and detailing the methods employed to eliminate biased data. Section III presents a review of relevant literature concerning the Synthetic Difference-in-Differences (SDID) method and descriptive analysis for the data, which serves as the basis for the analysis. Section IV is dedicated to explaining and interpreting the results obtained from the analysis. Finally, in Section V, the conclusion of the thesis is presented.

1.4 Literature Review

Migration effects for the migrated countries and effects of immigrants' homeland have been discussed for decades in literature. According to 2022's World migration Report which was published by the International Organization for Migration (IOM) periodically, there is a significant increase in the number of international migrants which has increased by 62% in 22 years.

	2000	2022
Estimated number of international migrants	173 million	281 million
Estimated proportion of world population who are migrants	2.8%	3.6%
Estimated proportion of female international migrants	49.4%	48.0%
Estimated proportion of international migrants who are children	16.0%	14.6%
Region with the highest proportion of international migrants	Oceania	Oceania
Country with the highest proportion of international migrants	United Arab Emirates	United Arab Emirates
Number of migrant workers	–	169 million
Global international remittances (USD)	128 billion	702 billion
Number of refugees	14 million	26.4 million
Number of internally displaced persons	21 million	55 million

Figure 1.1 : Key Facts and Figures Comparison, (World Migration Reports, 2022)

Aghion & Meghir and Vandenbussche (2004) explained how migration occurs between migrated and immigrant's home countries and proves the discussion that skilled labor has a higher growth-enhancing effect when the country is closer to the technological frontier. Firstly, development needs to be considered to explain the migration. Human capital is the key main factor to increase development (growth) by using more skilled labor in the economy. There are two main factors in which human capital can be divided which are Innovation and Imitation. Innovation and imitation require different types of human capital since the imitation sector does not need highly skilled workers while innovation has to use them. Cobb-Douglas production function has stated above:

$$y_t = \int_0^1 A_{\mathrm{i},t}^{1-\alpha} x_{\mathrm{i},t}^{\alpha} \, \mathrm{di} \qquad (1.1)$$

Where y_t is the output which can be considered growth, A is the productivity and the x is the flow of intermediate goods. Rather than increasing the flow of intermediate goods which is in equilibrium, increasing the productivity factor will be a better option. A is a result for technology improvements divided into imitation activities which adopt the world frontier technologies and innovation in the local technological frontier. If one country's value is lower than the world productivity frontier, focusing on imitation is sufficient since innovations' purpose is increasing the productivity frontier. Consequently, less developed countries tend to increase their imitation sector with unskilled people while more developed countries try to increase their world frontier by increasing the imitation sector with skilled workers and more developed countries supply the skilled workers from the less-developed countries. From the perspective of migrants, they want to work with better salaries and better job options. So, they want to migrate to the countries that need labor for the innovation sector and salaries are higher (Vandenbussche et al. 2014).

Sjaastad wrote a session called "The Costs and Returns of Human Migration" in the book of Regional Economics: A reader which was edited by Harry. W Richardson (1970). The session explains the importance of considering the gross migration rather than the net migration. For instance, if the net migration can be zero or negative while the number of people who've resettled into this area could be million. Because net migration is calculated with the difference between the number of migrated citizens to another area and migrated people to this city. Also, this publication shows that people think migration as an investment that increases the productivity of human resources, an investment which has costs and which also renders results". In consequence, it has been proven that young people tend to migrate rather than older ones because the return of the migration is higher relatively than older people who do have a short life time period in their lifetime (Richardson, 1970).

Di Maria, & Stryszowski (2009) aimed how the possibility of migration changes the composition of human capital and how development was affected with migration. Researchers create a model and separate the migration effect in different situations. In order to develop a model, total productivity factor, effective unit of human capital, distribution of less skilled people and more skilled person and time and growth factor is used. A less developed country catches a more developed one and also reaches a steady state in the absence of migration. If the possibility of migration is equal between the technical skilled person who works in imitation and skilled person who works in innovation, growth rate in the less developed country decreases in the short-run, workers can work in the leading country in which innovation is their priority. There is complete specialization in innovation in the more developed country. On the other hand, if there is an inequality in the possibilities of migration between the innovation and imitation workers, there is a lack of complete specialization in the lagging country in the long-run (Di Maria & Stryszowski, 2009).

Akanbi (2017) investigated 19 Sub-Saharan African (SSA) countries were selected to examine the impact of migration on economic growth and human development using 2SLS. The chosen SSA countries were selected to mirror the demographic structure of all of Africa. Therefore, the study can be considered a reflection of the entire African context. In this study, GDP and UNDP's HDI scores were used as dependent variables. Independent variables included variables such as remittances, social expenditure ratios, and inequality. Data were collected from sources such as the World Bank Databank, African Development Indicators, and IMF International Financial Statistics database spanning from 1990 to 2013. As a result, it was observed that remittances had a significant negative impact on both HDI and GDP. Additionally, increasing inequality was found to have a negative impact on HDI and GDP. Social expenditures were observed to have a positive impact on HDI (Akanbi, 2017).

Ramirez (2002) aimed to compare human development, as published by UNDP, with economic growth. Additionally, by using the values of government social expenditures, he employs the OLS (Ordinary Least Squares) method for calculations. The results show that social expenditures increase life expectancy and GDP. Consequently, Ramirez argues that there is a bidirectional relationship between economic growth and human development. He concludes that while economic growth provides funding for human development, human development in turn supports long-term economic growth. Furthermore, as variables such as life expectancy positively affect GDP, he demonstrates that human development should be considered not only in terms of income levels but also through indicators like health, education, and life expectancy. Additionally, he has clearly demonstrated the positive impact of social expenditures on development. Therefore, government decisions and expenditures have a direct effect on the HDI (Ramirez et. al., 2000).

There is another assumption which is stated by Contreras (2013) at the International Economic Journal that remittances have a negative impact on migrants. Contreras creates a model that two countries exist which are poor and bad. Model explains the effects of migration on human capital development. It is explained that a migrant's investment effect on their child's education falls with the strength of the dependence on their home country while in poor countries it is opposite. In summary, higher remittances reduce migrants' savings and investments in their child. Moreover, there is a disadvantage for the migrants that have strong links to the source country since lack of investment in their own child human capital development (Contreras, 2013).

Yang, Han & Song (2014) analyzed the relation between population distribution and economic development in China, Sichuan. They try to analyze what variables have significant effects for migration. To create a model, net migrants are used for dependent variables and plenty of independent variables are included in their model. They found that rural employment has significantly decreased the probability of net migration. It is stated that higher economic inequality levels lead to higher possibility of migration. Also, it is found that average wages do not change the probability of net migration significantly (Song et al., 2014).

Kunwar (2015) investigated the countries with high emigration rates. He interpreted remittance rates of emigration countries according to Wordbank data. According to Kunwar, for remittances to return to the country as investment, a stable and reliable social and political environment is necessary. Here, the skills acquired by migrating migrants in the country they go to, their likelihood of returning, etc., all play an important role. Looking at the number of migrants, Kunwar's observations indicate that migrants often work in what he terms as "Dirty, Dangerous and Demeaning" (3D) jobs. Due to being mostly unskilled or semi-skilled, many migrants are exposed to these 3D jobs. Therefore, remittances are often challenging for most migrants. It is difficult to see a country that has developed solely through remittances. Examples of this include Mexico and the Philippines. Remittances can only assist in development (Kunwar,2015).

The papers mentioned above are about global immigration in the world. The situation of Türkiye is slightly different from global immigration terms since there is a rapid increase in the immigration due to the Civil War in Syria.

From a labor perspective, Aydemir & Kırdar (2017) investigate the impact of ethnic Turks migrating from Bulgaria in 1989 due to political instability. They found that this influx led to higher unemployment rates among native men, with a more pronounced effect on younger natives and those with educational levels similar to the immigrants. However, the situation with Syrian migrants in Turkey is quite different. Firstly, ethnic Turks from Bulgaria were able to join the formal labor market. Secondly, they did not encounter any language barriers. To analyze the effects of Syrian workers in Turkey, Çeritoğlu, Yüncüler, Torun & Tumen (2017) stated that employment losses were incurred due to the influx of Syrian refugees. Additionally, this situation led to a decline in labor force participation and the job-finding ratio (Çeritoğlu & Yüncüler, 2017). From the other perspective, Tanrıkulu (2022) assumes that Syrian migration inflows to Turkey led to an increase in Turkey's economic growth by increasing demand for the possessions. However, in the short run, the migration also led to increase in inflation and unemployment (Tanrıkulu, 2020). Wagner & Del Caripo (2015) explained the influx of Syrian refugees into Turkey caused a decrease in the proportion of natives in the informal sector. Also, less skilled employment was increased for men in Turkey (Wagner & Del Caripo, 2015). Ceritoğlu et al. (2017) used a difference-in-differences approach with data from the 2010–2013 Turkish Household Labor Force Survey (THLFS) to estimate these effects of Syrian migrants on the labor market outcomes for natives in Turkey. They defined the five NUTS-2 regions with the highest migrant-to-native ratios as the treatment group and used four neighboring NUTS-2 regions in eastern Turkey as the control group. Their conclusions were based on heteroskedasticity-robust standard errors. As a result, wage outcomes have not been affected, while they resulted that there is a negative effect on employment outcomes for the natives. However, their analysis is replicated by Aksu et. al (2018) and clustered the standard errors at the region-year level, it can be found that their claims of statistical significance nearly disappeared. This is likely not surprising because their data only extended up to 2013, and their treatment variable did not account for changes in migrant intensity between 2012 and 2013. Cengiz and Tekgüç (2018) investigate the labor market impacts of Syrian migrants in Turkey. They employ both difference-in-differences and synthetic control methods using data from the 2004–2015 Household Labor Force Survey (HLFS). However, their analysis relies only on 2015 data for the ratio of migrant-to-native. They categorize three NUTS-2 regions with the highest migrant ratios as the treatment group and NUTS-2 regions with the lowest migrant ratios as the control group. Despite having data for four years post-treatment, with considerable variation in treatment intensity, they use a binary variable to indicate treatment status. In another method, they focus on the treatment intensity across regions, but their key variable of interest remains the 2015 migrant-to-native ratio, even for the other post-treatment years of 2012–2014. Additionally, they only assess four employment outcomes: informal employment, overall employment, and employment for two distinct education levels. Their study does not consider gender differences or the distinction between informal and formal employment. They found no robust results for employment ratio in natives. Authors also states that there is more than 10% decrease in the workers' wages who are informally employed. However, native workers with less than a high school education do not experience this effect, due to an increase in the proportion of this group in formal employment.

Aksu (2018) attempted to estimate the impact of Syrians on natives in the labor market using the Difference-in-Differences IV method. Despite not observing a decrease in wages and unemployment rates, a decline in total employment for female workers was noted. To elaborate on total employment, it was divided into formal and informal sectors. While a decline was observed among native workers in the informal sector, this was compensated by an increase in employment in the formal sector. Increases in product markets led to a rise in labor demand in the formal sector. An increase of 10% in the ratio of migrants to natives results in an 8.6% increase in wages (Aksu et. al. 2018).

Turkum's 2023 study on the impact of refugees on GDP aligns most closely with the objective of this thesis. Employing the DID and 2SLS methods, Turkum attempts to assess the impact of Syrians on GDP at the provincial level. Through DID methodologies, she endeavors to interpret the migration effect on GDP in the medium, short, and long terms. The DID method suggests that if there's no specific effect, the difference between treatment and control groups remains constant until the effect occurs. Given the possibility of this assumption being flawed, Turkum incorporates year-region interaction and fixed effects. Consequently, Turkum (2023) finds a negative impact of refugees on GDP in the sort, medium, and long run. Despite sharing the same objective of assessing impact of migration with this thesis, Turkum's (2023) analysis takes a different path due to her utilization of the DID method and solely focusing on GDP as a dependent variable.

Caro's report which was published by International Labor in 2020, the concentration of Syrians in low-skilled, informal jobs is due to the presence of highly skilled workers in Turkey. It is estimated that 10% of all Syrian workers have a higher education diploma. However, only 28.9% have been able to find jobs in the professional category. When examining the specific occupations within the professional category that Syrian workers are engaged in, it is evident that half of them are working as teachers without work permits, further narrowing the range of available professions for this group.

Çakır et al. (2021) used the Differences-in-Differences IV method, demonstrates that the number of child laborers in the informal sector decreased following the influx of Syrian refugees, with no discernible effect observed in the formal sector. Regarding gender, it was found that school enrollment rates increased only among boys. Every 10 Syrian refugees led to the displacement of 7 native male child laborers, indicating an increase in school enrollment. While 5 out of 10 female child laborers lost their jobs due to the influx, no increase in school attendance was observed among them. Most of these cases involved individuals attempting to balance both school and work simultaneously. Of the 7 displaced male child laborers, 4 are those who used to combine school with work and transitioned to attending school full-time. The other 3 who are not employed made a transition from only employed status to only enrolled status, so there is no change in NEET (Not in Education, Employment, or Training) status for male children, while out of the 5 girls who lost their jobs, 2 have transitioned to NEET status. It can be said that refugee impact on girls' human capital accumulation is more negative than that of boys (Çakır et. al, 2021).

Balkan & Tumen (2016) aimed to investigate the impact of migration on consumer prices using the Difference-in-Differences (DiD) method. They employed the natural logarithm of price levels as the dependent variable. Following their DiD analysis, they found that consumer prices decreased by 2.5%. The reason identified for this was the entry of Syrian migrants into the informal sector, where they worked for much lower wages compared to natives. They demonstrated that in provinces with a high concentration of refugees, the presence of the informal sector led to lower consumer prices. The labor cost advantage contributed to the decrease in consumer prices (Balkan & Tumer, 2016).

2. DATA

2.1 Definition of Development Indexes

Contrary to popular belief, politicians and economists do not focus on increasing GDP solely to increase citizens' wealth. Governments' main action for comprehensive development is improving their citizens' living conditions in terms of wealth, wellness, and security. Since it is a global discussion for all policymakers and economists, various indexes have been created by several institutions. One of the most popular publications that include variables to measure general development is the Human Development Index, published by the United Nations Development Programme. There are several articles that highlight the significance of the Development Index for different regions. Ranis & Stewart (2003) assumed that there is a significant positive effect between HDI and GDP. Moreover, the significance of HDI's influence on GDP is greater than GDP's influence on HDI. Therefore, increasing GDP alone is not sufficient for wealth and development. As stated, since HDI covers a variety of fields indicating development in extensive areas, states endeavor to increase the HDI in their localities.

HDI enables comparison of specific zones in terms of socio-economic development. Multifarious variables that reflect development factors were implemented into HDI in some of the organization's calculations. Moreover, it is expected that some variables are seasonal and unique to the years calculated since technological processes are developing day by day. Technological accessibility to new innovations becomes easier when another innovation takes place (e.g., the existing mobile phone per citizen ratio). Consequently, when accessibility to one factor increases and spreads to all regions, it can be neglected in calculating HDI to prevent including insignificant variables into the data, thus avoiding biased data for the SEGE report published periodically by the Turkish Government. Conversely, some institutions, such as UNDP, have been calculating HDI with the same variables for 20 years to make comparisons easier. UNDP variables are time-independent, such as GDP per capita and life expectancy indexes. For comparison, using UNDP reports creates a robust model since the variables to calculate the development index are stable and time-invariant, while SEGE is changing. Also, according to SEGE's report, making comparisons between SEGE reports does not create efficient and reliable results since the variables to calculate the Development Index do not remain equal between the SEGE reports. Even though the variables remain equal, their weights change due to the calculation method of the index, which is Principal Component Analysis (PCA). PCA enables measuring the development points by creating a main component that contains many variables whose weights change accordingly. In conclusion, since the UNDP reports' index calculation method is the same for all time periods, UNDP reports are considered in calculations. Therefore, the UNDP report is taken as a reference in this paper to create unbiased expressions.

The UNDP (United Nations Development Programme) is an organization founded in 1965 whose main purposes are ending poverty, reducing inequality between regions, building democratic governance, and preventing climate change. To achieve some of these purposes, UNDP developed a model to calculate HDI to reflect the development points of different regions. Another purpose of publishing Human Development Reports is to create a development network worldwide. The organization works with governments and municipalities in 166 countries to augment development to prevent poverty and child deaths and increase life expectancy. To value the HDI, UNDP created an HDI Index in 1990. Further UNDP reports also include several indexes to calculate specific development metrics in various branches, such as the Gender Inequality Index (GII), Inequality-Adjusted Human Development Index (IHDI), and Gender Development Index (GDI). These indexes will be discussed in detail in the next sections.

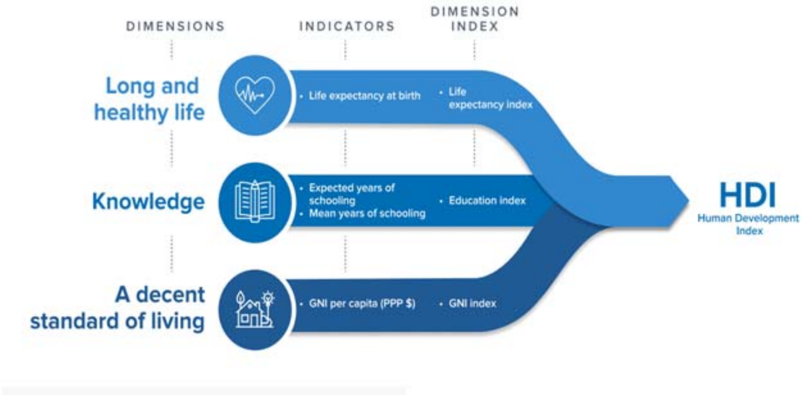


Figure 2.1 : Variables to Calculate HDI (Source: UNDP).

As mentioned above, the variables used to calculate HDI are the same in all UNDP reports. This consistency allows for comparisons between previous and subsequent UNDP reports. There are three main indexes used to calculate HDI: the Life Expectancy Index, the Education Index, and the Standard of Living Index. The average of these indexes constitutes the HDI. To calculate the Life Expectancy Index, several measurements are used, such as mortality ratio, probability of living to a specific age, and total years lived after a specified age. The variables used to calculate the Education Index include schooling rates in primary and secondary schools. There is one main variable used to calculate the "Standard of Living Index," which is GDP per capita.

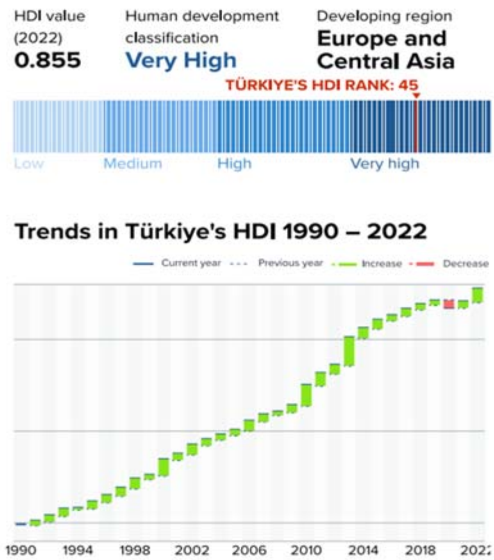


Figure 2.2 : Türkiye's HDI Ranking Between the Regions (UNDP, 2022).

Türkiye's ranking among countries has been increasing day by day. According to the 2022 UNDP data, Türkiye ranks 45th out of 193 countries and is among those with a very high development index. Based on the 2022 data, Türkiye has been in the very high human development category (the highest of the four categories) for the fourth consecutive year. It is observed that Türkiye's HDI score decreased only one year during the pandemic period. Since our study is based on provinces, although Türkiye's regional ranking will be mentioned, further details will not be provided.

The last report from UNDP that includes Türkiye's provincial HDI data was published in 2004. After the 2004 report, there have been no calculations of HDI at the provincial level. Since 2004, UNDP has started publishing HDI reports for global rankings between countries only. Therefore, there is no official measurement for the provinces.

2.2 Limitations about the Dataset

Making comparisons between provinces is vital for creating a model to investigate the effects of development across different zones. Since there are no official publications for making comparisons between the provinces of Türkiye, Yiğiteli & Şanlı's (2020), which calculates the HDI province by province, is taken as a reference. Several papers have attempted to calculate HDI in numerous ways using UNDP's method. Specifically, Yiğiteli & Şanlı (2020) provided a way to make comparisons between provinces over a period of 10 years. This publication creates a model that follows the same method as the UNDP to calculate indexes such as HDI, IHDI, GII, and GDI between 2009 and 2018. They use the same method and variables as the UNDP. For their dataset, they use several sources from Turkish Government Publications and the Turkish Statistical Institute (TÜİK/TURKSTAT). Therefore, the data used for comparison spans the years 1995-2018. Additionally, some indexes (IHDI, GII) were introduced by the UNDP in 2010. Yiğiteli & Şanlı (2020) also calculated these indexes using the same methods as the UNDP for Turkey's provinces between 2009 and 2018. Hence, for the indicated indexes, the calculation covers the years 2009-2018 (Yiğiteli & Şanlı, 2020).

Consequently, several indexes published by the UNDP indicate poverty, inequality, and wealth across regions and genders. Since the UNDP has not calculated the indexes of provinces since 2000, the paper of Yiğiteli & Şanlı (2020) was used as a reference for these expressions.

Indexes consist of multiple sub-indexes. Due to the lack of data on the sub-indexes, I was unable to analyze how changes in the sub-dimensions affected the main index; I could only analyze how Syrians affected the main indexes (HDI, IHDI, GDI, GII).

The effect of including covariates, such as population and dependency ratio growth, on the results was examined. However, in the Synthetic Difference-in-Differences (SDID) method, adding covariates disrupts the method's flexbility, leading to less reliable results. According to Arkhangelsky (2021), instead of adding covariates, adjusting the fixed effects, unit weights, and time weights used in the SDID method provides more accurate data. Therefore, covariates were not included in the analysis.

2.3 Explanation of UNDP's Human Development Index

There is a significant relationship between the population and the socio-economic variables that include population size, population growth rate, and age distribution. These variables reflect the effective population distribution. Demographic transition refers to a period where birth rates are higher and death rates are lower compared to earlier eras. This transition period shows an increased ratio of the working-age population, which boosts development, as this ratio is significantly higher. Consequently, development rapidly increased during this period. According to the United Nations definition, during the demographic transition era, the proportion of people aged over sixty-five is less than 15% of the total population, while the proportion of the youth population (under 15) is below 30% (UN, 2004). Therefore, the Life Expectancy Index can be considered a vital indicator of development.

Secondly, since the population of those who can work is higher during this period, increasing the quality of education and the health sector can lead to significant improvements in the efficiency and quality of the workforce. Thus, years of schooling need to be considered for development. On the other hand, Gross National Income (GNI) per capita is a crucial indicator, as it can be determined by considering the quantity and quality of resources in a specified region.

2.3.1 Components of HDI

As mentioned above, there has been no official data from the UNDP for the provinces in Turkey since the UNDP shifted to publishing new reports from a regional perspective. Provinces have not been included in their publications since the 2004 report. Therefore, Yiğiteli & Şanlı (2022)'s HDI points are used for the years 2009 to 2018, year by year. Additionally, since their calculation method is the same as the UNDP's, the calculations from 1996, 1997, and 2000 are taken from the UNDP report.

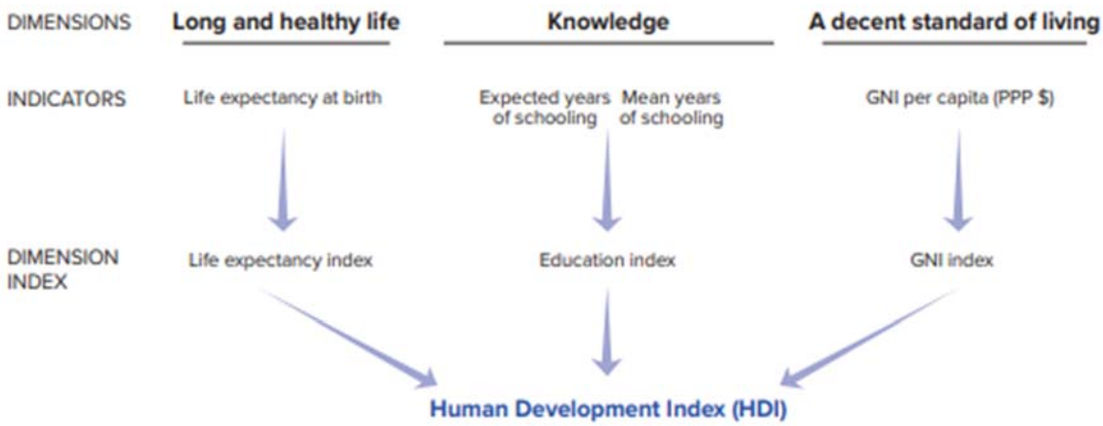


Figure 2.3 : HDI Calculation Dimensions (UNDP, 2023).

There are limitations to the UNDP calculation in Yiğiteli & Şanlı (2020)'s article due to a lack of data from Turkish Government reports. To calculate HDI, the Life Expectancy Index needs to be determined. Life expectancy at birth reflects the overall death rates. Additionally, when death rates remain stable over time, life expectancy can also represent the average years of life expectancy for the population (WHO, 2006). To calculate the expected living years, the government's life data, known as the Life Chart, can be referenced for different age groups and genders. However, the Life Chart is published by the Turkish Government only once every three years. Therefore, the authors attempted to create a new dataset for each year that is compatible with UNDP's HDI calculation for each gender.

Moreover, due to the lack of detailed data that does not include every individual age, the Turkish government groups ages into ranges. This grouping presents additional challenges for accurately calculating life expectancy and, consequently, the HDI.

d_{nx} = death count for the ages between x and x+n,
q_{xn} = probability of death until x+n for the people that is in x ages,
d_{xn} = death count between the ages of x and x+n in the Life chart ,
I_x= people who reaches the age of x,
L_{xn}= total years which population live between the x and x+n,
T_x = the total living years after the age of x,

e_x-= expected living years after the age of x,

a_{xn}= the average living years of the dyed people between the years x and x+n,

$$d_{xn} = q_{xn} I_x = I_x + I_{x+n} \quad (2.1)$$

$$L_{xn} = (n I_{x+n}), +(d_{xn} a_{xn}) \quad (2.2)$$

$$T_x = \sum_{a=x}^{\infty} L_\alpha \quad (2.3)$$

$$e_x = T_x / I_x \quad (2.4)$$

In equation 2.1, the total death between the years of x and x+n is calculated. After that, total years of the population which lives between x and x+n is calculated with the equation of 2.2. There is no actual data for ax. So, according to Preston, ax is taken as an ax= n/2. The total living years after the age of x, T_x, can be calculated with equation 2.3. After that, with equation 2.4, life expectancy at birth has been calculated.

The second variable is the education index which contains mean years of schooling and expected years of schooling Expected years of schooling (EYS) indicates the time period that a school age child can take in his/her lifetime between the first school year and the last. EYS is calculated according to the equation 2.5

$$EYS_\alpha = \sum_{i=\alpha}^{n} \frac{E_{i,l}}{P_i} + \frac{E_{u,l}}{SAP_l} D_l \quad (2.5)$$

$E_{i,l}$: i age group registered to l school level

P_i : population of age group i

$E_{u,l}$: unknown age group registered to l school level

SAP_l : all population needs to be registered in l school level

D_l : theoretical education year for the l education level

Yiğiteli & Şanlı (2020) could not use the calculation mentioned above due to a lack of data. As an alternative, Yeşilyurt's (2016) method (Eq. 2.6) is used to measure Expected Years of Schooling (EYS).

$$EYS = \sum_{l=1}^{7} ER_l \cdot D_l \quad (2.6)$$

ER_l: net schooling rate for the l educational level

D_l : theoretical education year for the l education level

Another calculation is to measure the schooling index called "Mean Years of Schooling" (MYS), which reflects the average number of schooling years among the total population aged 25 and above who have completed their education. Equation 2.3.2.7 reflects the MYS (UNESCO, 2013).

$$MYS = \sum_a \sum_l HS_{\alpha l} YS_{\alpha l} \quad (2.7)$$

$HS_{\alpha l}$: net schooling rate for the l educational level

$YS_{\alpha l}$: theoretical education year for the l education level when a age group is in school

a =age groups (25-29,30-34,35-39….65+)

TÜİK considers that the educational year is denoted as "1" for literate people who have not received any formal education in school.

The third index is GNI, which dataset is obtained from TÜİK province by province. No additional calculation is required to obtain GNI.

In conclusion, to calculate the schooling index, the arithmetic mean of the EYS index and MYS index needs to be taken. For the income index, it is noted that as income increases, its effect on wealth decreases, as per the concave transformation function of income to capabilities, according to Amand & Sen (2000). Therefore, the natural logarithms of the actual, minimum, and maximum values are used to calculate the income index in Equation (2.8).

To calculate HDI, three indexes need to be dimensioned with dimension indexes using the equation mentioned above. With the dimension index, all the indexes exist with a value between 0 and 1.

$$Dimension\ index = \frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value} \quad (2.8)$$

Determining the maximum and minimum values is explained in the UNDP HDI report's technical notes. For the life expectancy index, researchers suggest that the minimum life expectancy at birth is 20 and the maximum is 85 (Maddison 2010; Oeppen and Vaupel 2002; Riley 2005). UNDP adopts these values as a reference.

The second index is schooling indexes, with a minimum of 0 years of schooling. The maximum for expected years of schooling is set at 18, which is sufficient to obtain a master's degree in most regions.

The final index is GNI per capita, with a minimum value of \$100 and a maximum of \$75,000 per capita. According to UNDP, only five countries (Liechtenstein, Qatar, Singapore, Ireland, and Luxembourg) had a GNI per capita exceeding \$75,000 in 2022.

After all the indexes are calculated separately, the geometric mean of the three dimensions is computed in order to calculate HDI (Eq. 2.9).

$$HDI = (I_{health} \cdot I_{education} \cdot I_{income})^{1/3} \quad (2.9)$$

2.4 Explanation of IHDI (Inequality-adjusted Human Development Index)

Even though Turkey's HDI is increasing day by day, the inequality of HDI between provinces is also increasing. It can be observed that the HDI of some regions is increasing, while that of others remains the same or even decreases. To reflect this trend, Yiğiteli and Şanlı's article needs to be analyzed. While HDI was the primary concern of researchers until the last decade, the Inequality-Adjusted Human Development Index (IHDI), which reflects inequality within a specific area, was introduced by the UNDP in 2010.

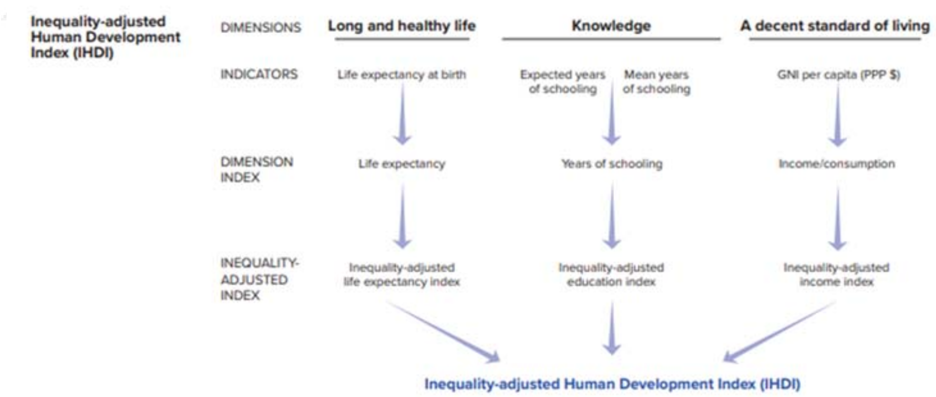


Figure 2.4 : IHDI Calculation Dimensions (UNDP,2023).

Inequality-Adjusted Human Development Index calculates the inequality by using the calculation;

$$A_x = 1 - \left(\frac{g_x}{\mu_x}\right) \quad (2.10)$$

Where A_x represents the inequality ratio and g_x, μ_x denote the geometric average of a dimension for calculating HDI and the arithmetic mean of the same variables, respectively. Remarkably, according to UNDP technical data, since the HDI is calculated using aggregates at the country level, such as national accounts for income, additional dataset resources are required to gather various observations into the distribution for calculating the IHDI. In the UNDP calculation, life expectancy data is referenced from UNDESA's life tables (2022), where mortality rates and related information for age groups are available. Unfortunately, there is no explanation in Yiğiteli & Şanlı's paper regarding the datasets used for calculating the IHDI.

$$I_x^* = (1 - A_x)I_x \qquad (2.11)$$

To calculate IHDI, the following calculation is used where I_x represents the specific index for a specified dimension and I_x^* is the IHDI of specified dimension.

$$IHDI = (I_{health}^* \cdot I_{education}^* \cdot I_{income}^*)^{1/3} \qquad (2.12)$$

The total IHDI can be calculated by taking the geometric average of all groups multiplied by the inequality indexes (Eq. 2.12). In conclusion, IHDI allows for comparisons between provinces. However, since the index was introduced in 2010, there are no measurements of IHDI in UNDP reports before 2010. When considering Yiğiteli's calculations, they computed the IHDI province by province for the period between 2009 and 2018. Lastly, according to the equations, IHDI cannot exceed HDI; it is dependent on the HDI. A lower IHDI implies higher inequality, as when inequality in the country is zero, HDI equals IHDI.

2.5 Gender Development Index

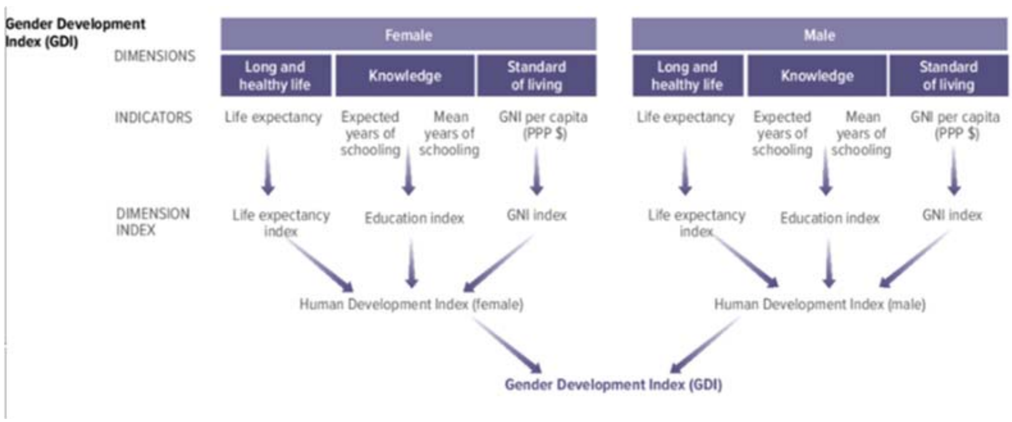


Figure 2.5 : GDI Calculation Dimensions (UNDP,2023).

There is another index that reflects the inequalities of HDI between genders, which is named GDI (Gender Development Index). GDI has been included in UNDP's Human Development Reports since 1995, providing an opportunity to make comments and comparisons between different years. Briefly, GDI is the ratio of women's HDI to men's. Therefore, HDI needs to be calculated separately for women and men when computing GDI. When the ratio converges to 1, it can be said that HDIs are equal between genders.

$$HDI^f = \left(I^f_{health} \cdot I^f_{education} \cdot I^f_{income}\right)^{1/3} \tag{2.13}$$

$$HDI^m = (I^m_{health} \cdot I^m_{education} \cdot I^m_{income})^{1/3} \tag{2.14}$$

$$GDI = \frac{HDI^f}{HDI^m} \tag{2.15}$$

GDI does not accurately reflect gender inequalities. It solely indicates the ratio of HDIs between genders.

$$S_f = \frac{(W_f/W_m)EA_f}{(W_f/W_m)EA_f + EA_m} \; and \; S_m = 1 - S_f \tag{2.16}$$

S_f : female share of wage bill,

S_m: male share of wage bill,

W_f/W_m : female to male wage ratio,

EA_f: the female shares of the economically active population,

EA_m : the male share of the economically active population,

$$GNIpc_f = GNIpc\ S_f \ / \ P_f \tag{2.17}$$

$$GNIpc_m = GNIpc\ S_m \ / \ P_m \tag{2.18}$$

Estimated female earned income per capita ($GNIpc_f$) and Estimated male earned income per capita ($GNIpc_f$) are obtained from the equation above, where $P_f = N_f \ / \ N$ represents the female share of the population and $P_m = 1 - P_f$ represents the male share of population.

S_f and $S_m$are sourced from the Republic of Turkey Presidency of the Social Security Institution for Yiğiteli & Şanlı (2020)'s calculations. They gathered data province by province, and the economically active population can be calculated through re-calculation based on TÜİK datasets by researchers. Schooling levels for each gender are sourced from three different Turkish government official reports (MEB, TÜİK, YÖK).

2.6 Gender Inequality Index

The Gender Inequality Index (GDI) has limitations as it is significantly dependent on HDI and cannot be separated from it. To overcome these limitations, the Gender Inequality Index (GII) was introduced by UNDP in 2010. Since there is inequality between genders in health, empowerment, and the labor market, GII measures the gap between male and female access in these areas. Unlike classical development indexes, various metrics are used to calculate GII, such as female and male shares of parliamentary seats and female and male labor force participation rates. According to UNDP, GII consists of three main dimensions: reproductive health, empowerment, and the labor market.

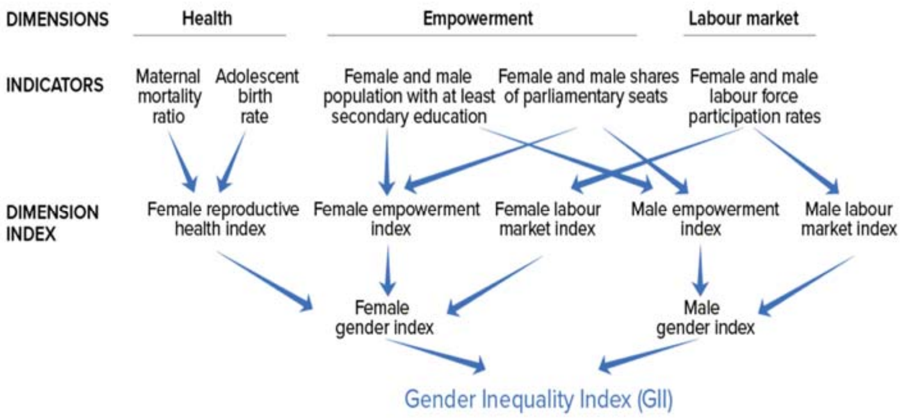


Figure 2.6 : Calculation of GII (UNDP,2023).

Minimum value for the indexes needs to be taken 0.1% since geometric mean cannot be taken 0. For maternal mortality, the maximum value is 1000 deaths per 100,000 births and the minimum value is 10.

$$G_F = \sqrt[3]{\left(\frac{10}{MMR} \cdot \frac{1}{ABR}\right)^{1/2} \left(PR_f SE_f\right)^{1/2} LFPR_f} \qquad (2.19)$$

$$G_M = \sqrt[3]{(PR_M SE_M)^{1/2} LFPR_M} \qquad (2.20)$$

Aggregation formulas for the genders are stated in Calculation 2.19 and 2.20. For the parliamentary seat ratios, the municipalities' seat percentages for genders are used for calculation.

Unfortunately, since GII was published in 2010, there is no data to compare to GII for earlier years.

$$HARM(G_f, M_M) = \left[\frac{(G_F)^{-1}+(G_M)^{-1}}{2}\right]^{-1} \quad (2.21)$$

Harmonic mean is utilized to express the indices in equation 2.21. Employing the harmonic mean of within genders' geometric averages signifies the disparity between genders. It addresses the intersecting inequalities across different dimensions.

Taking geometric means of the arithmetic means of each indicator for all genders.

$$G_{F,M} = \sqrt[3]{\overline{Health} \cdot \overline{Empowerment} \cdot \overline{LFPR}} \quad (2.22)$$

$$where\ \overline{Health} = \left(\sqrt{\frac{10}{MMR} \cdot \frac{1}{ABR}} + 1\right) / 2 \quad (2.23)$$

$$\overline{Empowerment} = \left(\sqrt{PR_F\ SE_F} + \sqrt{PR_M SE_M}\right) / 2 \quad (2.24)$$

$$\overline{LFPR} = \frac{LFPR_F + LFPR_M}{2} \quad (2.25)$$

Health is not calculated as an average of the indices.

Utilizing the harmonic mean of within-group geometric averages highlights the disparity between women and men while also compensating for the correlation between several factors. Essentially, it addresses the intersecting inequalities across different dimensions by using Equation 2.26.

$$GII = 1 - \frac{HARM(G_F, G_M)}{G_{\overline{F},\overline{M}}} \quad (2.26)$$

To calculate GII, adolescent birth rate and birth death rate are derived from TÜİK data, while the gender ratio of parliamentary seats for local municipalities is sourced from TÜİK, given that provinces are being calculated. Schooling rates are obtained from MEB, TÜİK, and YÖK.

2.7 Used Dataset for the Calculation

Although many reports have been published by UNDP, those issued after 1997 were particularly significant for creating a comparison model due to missing provinces in previous reports. The reason for the missing provinces is that Turkey's number of provinces increased to 81 in 1999. The 1997 report contains only 76 provinces due to undivided areas that were to be separated from their mother provinces by 1999. Missing provinces can be estimated using a projection method.

Since the methods are mentioned above, the reports will not be investigated in detail. Rankings and index points are noteworthy in UNDP reports. After explaining the rankings, a comparison between UNDP and HDI will be made.

UNDP reports containing indexes calculated by the organization itself cover the years 1995, 1997, and 2000. To avoid confusion, the year considered for calculation is taken as the reference for making a robust comparison between the reports. After 2000, there is no official data from UNDP reflecting the indexes among provinces. As mentioned above, Yiğiteli & Şanlı (2020) serves as a reference, enabling a comparison between the years 2009-2018. Since the Syrian Civil War began in 2011 and significant immigration occurred in 2013, there are 8 years of pre-treatment and 6 years of post-treatment.

Although UNDP reports provide more data for a period than SEGE, they reflect unbalanced HDI rankings in some regions and provinces. This may be reasonable since there are no rankings between 2000 and 2009. With the new decade after 1990, technological revolutions and their impacts have significantly changed the global economic development trend. Therefore, it can be said that some regions could not keep up with the trend. For instance, Gaziantep's HDI ranking was 36, 39, and 30 in 1995, 1997, and 2000 respectively. Surprisingly, HDI rankings between 2009 and 2018 fluctuate between 61 and 66. Another province with very unbalanced HDI points is Hatay, whose ranking was 30 in the 1995 calculation, 33 in 1997, and 26 in the 2000 HDI index. Similarly, Hatay's ranking fluctuates between 51 and 56 between the years 2009 and 2018.

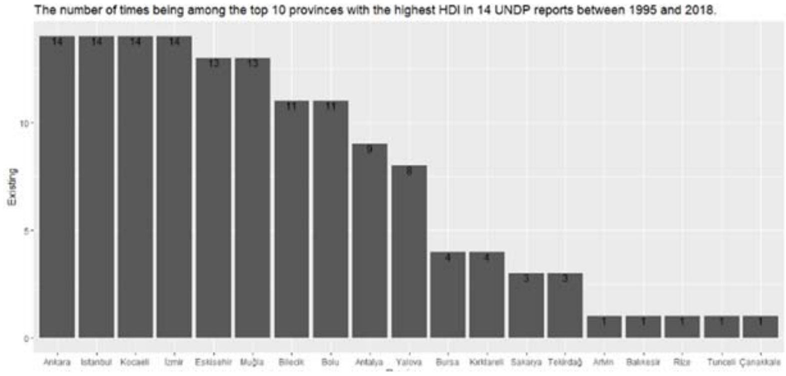


Figure 2.7 : Provinces that is in Top 10 Between 14 Reports, 1995-2018.

According to UNDP reports, the northwest of Turkey tends to dominate the HDI levels. However, certain provinces located outside the northwest region also feature on the list, such as Antalya, Rize, Tunceli, and Ankara. SEGE authors posit that if a province has a very high HDI relative to other provinces in a specific area, it can positively impact the HDI of its neighboring provinces. For example, Istanbul and Izmir are major metropolises with the highest HDI rankings in Turkey. As these cities become increasingly saturated due to factors such as population growth and traffic congestion, people tend to migrate to neighboring provinces rather than to the metropolises themselves. Additionally, stakeholders often invest in these nearby provinces as they are generally more affordable than the metropolises. In conclusion, the highest-ranked cities in terms of HDI may contribute to an increase in the HDI of their neighboring provinces.

2.7.1 Dataset Years for Indexes

Yiğiteli & Şanlı (2020) provide unbiased data since all the calculation methods remain consistent. Therefore, a dataset has been created, and Table 2.1 displays the data used for the calculation. As IHDI and GII were developed by UNDP in 2010, there are no official indexes for IHDI and GII at the province level. Therefore, Yiğiteli & Şanlı's calculations, which cover the years 2009-2018 for the provinces, are utilized.

Table 2.1 : Used Datasets for Calculate Immigrant Effect on Development.

Index	UNDP	Yigiteli & Sanli
HDI	1996,1997,2000	2009-2018
IHDI	-	2009-2018
GDI	1997,2000	2009-2018
GII	-	2009-2018

2.7.2 Comparison Groups in Province Level for Analysis

To compare Turkey's 81 provinces, two groups are cumulated: treatment groups and control groups. This comparison aims to assess the impact of immigration on development. As immigrant flow varies non-uniformly and sequentially, partial treatment groups are created for calculation. The provinces significantly affected by immigration are identified from Kayaoğlu (2022). The treated provinces are those that host more than 2% of Syrian refugees (Figure 2.8). Normally, Edirne needs to be excluded from the treatment group in 2018. However, since the effect of immigration is considered to persist permanently in the SDID calculation method, Edirne is included in the treatment group for 2018.

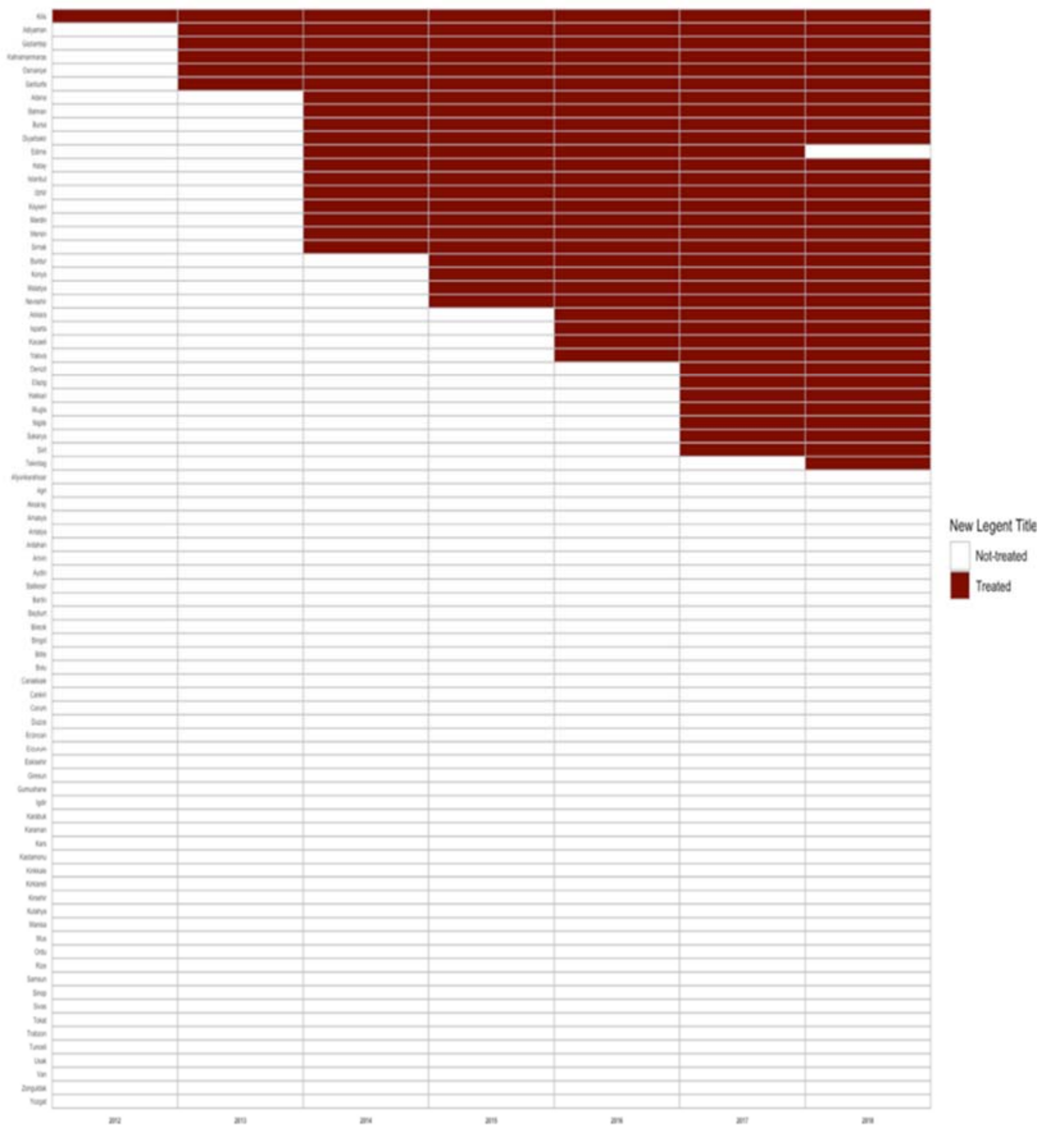


Figure 2.8 : Staggered Treatment Timing across Provinces (Kayaoğlu,2022).

3. IDENTIFICATION

3.1 Synthetic Difference in Differences (SDID) Method

There are commonly two methods used to analyze policy effects: Difference in Differences (DiD) and Synthetic Control Method (SCM). These methods help assess whether policy decisions have a significant impact on affected units. Policy makers seeking to implement similar rules can refer to these research findings. However, these methods may not be able to investigate decision effects comprehensively. The main idea behind these methods is to explain the effects and significance level of an event that occurred in a specific time and area by comparing units exposed to the change with those that are not. Abadie & Gardeazabal (2003) investigated the effects of conflicts on GDP, marking one of the initial publications using the Synthetic Control Method (Abadie & Gardeazabal, 2003). Similarly, Autor, Levy & Murnane (2003) explored how technological revolutions can affect capital using Difference in Differences. These publications share a common characteristic: they have a certain time threshold that causes revolutionary changes in some units (Levy & Autor & Murnane, 2003).

Choosing the appropriate estimator for specified data is crucial as methods have different ways of making assumptions. For instance, Arkhangelsky et. al (2019) investigated the average effect of increased taxes on California per capita cigarette sales over twelve post-treatment years, calculated using SCM, was compared with several estimators. The estimation coefficient differed by approximately 40% between the methods (SC estimate is -19.6 while DID estimation is -27.3). Hence, selecting the right method is vital for researchers aiming to explain unit effects (Arkhangelsky et al., 2019).

DID is used when researchers aim to make a "parallel trends" assumption between variables across several units. It requires the units to exhibit parallel trends to obtain unbiased results. Relative to SCM, DID allows for the use of wider units of data, as it remains unchanged with unit-level shifts. However, using units with dissimilar measurements can lead to biased estimations. In DID, there are no unit weights that fix the data.

On the other hand, SCM attempts to create equal measurements between units before the treatment period by calculating unit weights and applying them. It enables comparison of the units' pre-exposure trends to observe treatment effects on the treated. However, using numerous treatment variables in SCM can introduce bias, as the estimator attempts to create similar units in the pre-treatment period.

Arkhangelsky et. al (2019) introduced the SDID method, which combines DID and SCM. This method weights and creates parallel trends between units in the pre-treatment period to reduce reliance on parallel trend assumptions, similar to SCM. Furthermore, SDID allows for data to remain invariant to additional unit-level shifts, and it enables valid large-panel interference, like DID method. Hence, SDID may provide more robust estimations compared to DID and SCM. However, when there is heterogenicity in outcomes among units or time periods, giving unequal weights to these units and periods could decrease the reliability of estimates compared to the DID estimator.

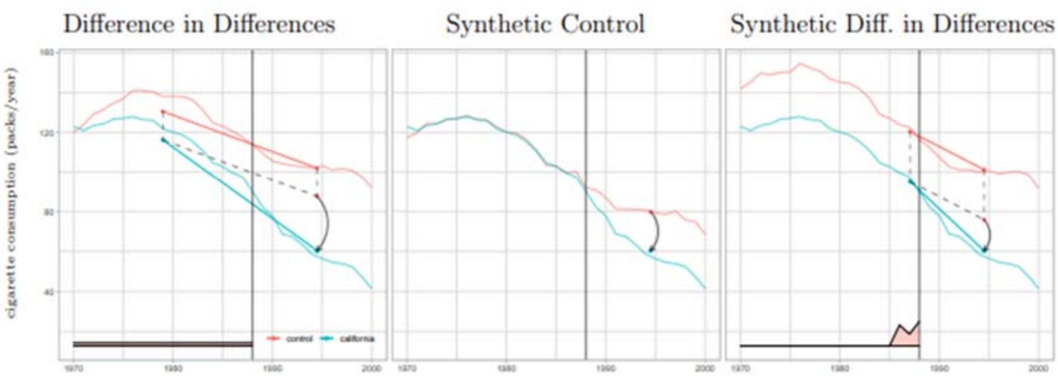


Figure 3.1 : Visual Expression of Three Methods, SDID, SCM and DID (Arkhangelsky et al. 2019).

The visualization of the methods can be observed in Figure 3.1. Additionally, SDID incorporates the use of time weights method, allowing for the exclusion of periods that may distort parallel trends by weighting the control group accordingly.

Next section elaborates on the mathematical expression of SDID and outlines the distinctions between the other two methods, DID and SCM.

3.2 Mathematical Expressions for Synthetic Difference in Differences

To calculate the Average Treatment Effect on the Treated (ATT) using the SDID Estimator, the first step is to calculate $\widehat{\omega}_{\square}$, needs to be calculated in order to determine the pre-exposure trends in the control group. which helps determine the pre-exposure trends in the control group. Let's consider a panel dataset with N units and T time periods. The outcome for unit i at time period t is denoted by Y_{it}. he binary treatment variable can be expressed as Wit {0,1}, where control units, denoted as N_{co}, never received the treatment, and treatment units, denoted as N_{tr}, were exposed to the treatment.

$$\sum_{i=1}^{N_{co}} \widehat{\omega}_{i\square}^{sdid} Y_{it} = N_{tr}^{-1} \sum_{i=N_{co}+1}^{N} Y_{it} \ for\ all\ t = 1 \ldots\ldots T_{pre} \quad (3.1)$$

In order to explain more detailed unit weights:

$$\left(\widehat{\omega}_0, \widehat{\omega}^{sdid}\right) = \underset{\lambda_0 \epsilon \mathbb{R}, \lambda \epsilon \Lambda_{\square}}{argmin}\, l_{unit}(\omega_0, \omega), \quad (3.2)$$

$$where\ l_{unit}(\omega_0, \omega) = \sum_{t=1}^{T_{pre}} \left(\omega_0 + \sum_{i=1}^{N_{co}} \omega_i Y_{it} - {}^{1}/_{N_{tr}} \sum_{i=N_{co}+1}^{N} + Y_{it}\right)^2 + \zeta^2 T_\rho \|\omega\|_2^2 \quad (3.3)$$

$$\Omega = \{\ \omega \epsilon \mathbb{R}_+^N : \sum_{i=1}^{N_{co}} \omega_i = 1,\ \omega_i = N_{tr}^{-1}\ for\ all\ i =\ N_{co}\ + 1, \ldots\ldots, N\ \},$$

Where $\mathbb{R}_+^N$ detones the positive real line. Regulation parameter $\zeta^{\square}$ can be set as:

$$\zeta^{\square} = \left(N_{tr} \cdot T_{post}\right)^{1/4^{\square}} \widehat{\sigma} \quad (3.4)$$

$$\sigma^2 = \frac{1}{N_{co}(T_{pre}-1)} \sum_{i=1}^{N_{co}} \sum_{t=1}^{N_{pre}-1} (\Delta_{it} - \bar{\Delta})^2 \quad (3.5)$$

$$\Delta_{it} = Y_{i(t+1)} - Y_{it} \text{ and } \bar{\Delta} = \frac{1}{N_{co}(T_{pre}-1)} \sum_{i=1}^{N_{co}} \sum_{t=1}^{T_{\rho re}-1} \Delta_{it} \quad (3.6)$$

ζ is a regularization parameter which enables matching size of one period outcome change Δ_{it} for the control group before the treatment period. After a one-period outcome change is calculated, it needs to be multiplied with motivated scaling $\left(N_{tr} \cdot T_{post}\right)^{1/4}$ in order to gain a regularization parameter. The difference between the classical Synthetic Control (SC) and SDID methods in calculating unit weights lies in the presence of the intercept termω_0 in the SDID method. This term exists because there is no need to create a trend that perfectly matches the treatment group. Establishing parallel trends between the groups is sufficient, as the fixed effects αi eliminate constant differences between different units. The inclusion of the intercept unit weight ω_0 facilitates the creation of a similar parallel trend, without which, the SDID unit weight calculation would be the same as SC.

Furthermore, before conducting the estimator calculation, time weights need to be computed by solving:

$$\left(\hat{\lambda}_0, \hat{\lambda}^{sdid}\right) == \underset{\lambda_0 \epsilon \mathbb{R}, \lambda \epsilon \Lambda}{argmin}\, l_{time}(\lambda_0, \lambda) \quad (3.7)$$

$$l_{unit}(\lambda_0, \lambda) = \sum_{t=1}^{T_{co}} \left(\lambda_0 + \sum_{i=1}^{T_{pre}} \lambda_t Y_{it} - {}^{1}/_{T_{post}} \sum_{i=T_{pre}+1}^{T} + Y_{it}\right)^2 + \zeta^2 N_{co} \|\lambda\|^2 \quad (3.8)$$

$$\Lambda = \{\lambda \, \epsilon \mathbb{R}_{+}^{T} : \sum_{i=1}^{T_{pre}} \lambda_t = 1, \lambda_t = T_{post}^{-1} \; for\ all\ t = T_{pre} + 1, \dots \dots, T\ \} \quad (3.9)$$

Although the calculation process is similar for both methods, there exists a difference between them. When calculating the time weights, regularization is not applied to permit correlated observations within time periods for the same unit, as suggested by earlier research findings.

Once the weights are determined, the estimator can be computed using the equation stated above:

$$\left(\hat{\tau}^{sdid}, \hat{\mu}, \hat{\alpha}, \hat{\beta}\right) = \underset{\tau, \mu, \alpha, \beta}{\operatorname{argmin}} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} (Y_{it} - \mu - a_i - \beta_t - W_{it}\tau)^2 \hat{\omega}_i^{sdid} \hat{\lambda}_t^{sdid} \right\} \quad (3.10)$$

3.3 Comparison Between the SDID, DID and SCM

It is mentioned in equation 3.11 that SDID is a combination of the DID and SCM methods. Consequently, generally SDID gives a robust estimation. If the reasons are investigated, estimators' equations between three calculations need to be analyzed. DID equation imply that there is no unit or time weights in the DiD estimator while SDID has in order to create constant difference between two groups. The similarities between the equations are allowing to shared temporal aggregate factors.

$$\left(\hat{\tau}^{did}, \hat{\mu}, \hat{\alpha}, \hat{\beta}\right) = \underset{\tau,\mu,\alpha,\beta}{\operatorname{argmin}} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} (Y_{it} - \mu - a_i - \beta_t - W_{it}\tau)^2 \right\} \tag{3.11}$$

For the SC estimator in Equation 3.12, there is no unit-fixed coefficient since units are adjusted by giving unit weights into the control group in pre-treatment period. However, adding very much weights in post-treatment periods can create an untrusted estimation due to overfitting problems. To prevent this, SDID tries to create constant difference between the data. Also, SDID uses time weights $\hat{\lambda}_t^{sdid}$ different than SC, if some periods create a difference between the groups, the weight of this period is decreased to gain accurate data.

$$\left(\hat{\tau}^{sc}, \hat{\mu}, \hat{\beta}\right) = \underset{\tau,\mu,\alpha,\beta}{\operatorname{argmin}} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} (Y_{it} - \mu - \beta_t - W_{it}\tau)^2 \hat{\omega}_i^{sc} \right\} \tag{3.12}$$

In conclusion, since the SDID uses the beneficial ways of the SC and SDID, it predicts more robust consequences rather than older two methods unless there is a heterogenicity between the control and the treatment group.

3.4 Calculation of Staggered Treatment Group by Using SDID

The staggered treatment group is elucidated in Equation (3.13) to facilitate a comparison between the groups. Sequential calculation is imperative to accurately reflect the overall effect on development resulting from immigration. Thus, the SDID estimator must conduct calculations for each year. Considering Figure 2.6, a total of 7 calculations are required as the effects of migration commenced in 2012 and persisted until 2018.

$$\widehat{ATT} = \sum_{for\ \alpha \in A} \frac{T_{post}^{\alpha}}{T_{post}} \hat{\tau}_a^{sdid} \tag{3.13}$$

where T_{post} comprises all the post-treatment periods observed in treated units that require estimation. In summary, the weighted average of all estimations is taken. For this study, the estimator calculates the average over 7 years, as the treatment spanned from 2012 to 2018.

3.5 Bootstrap Method for Calculation

Bootstrap, jackknife, and placebo represent three distinct techniques used in statistical analysis for estimating sampling distributions, creating confidence intervals, and assessing statistical significance. While both bootstrap and jackknife involve resampling processes for comparing results among groups receiving different interventions, they differ in their methodologies. Jackknife entails systematically extracting one observation at a time from the dataset and estimating bias and variance by repeating this process, then comparing the outcomes. On the other hand, Bootstrap involves resampling and comparing samples, without the need for systematic extraction of individual observations. Bootstrap is generally more flexible and applicable to a wide range of statistical calculations, making it suitable for HDI calculation. However, the placebo method, which randomizes controlled trials to assess treatment effectiveness, is more appropriate for clinical and controlled comparisons and is thus not considered in this context.

The block (bootstrap) method involves generating a substantial number, denoted as B, of bootstrap samples from the data. Instead of sampling individual data points, it samples entire blocks or clusters of data, referred to as units i, in the resampling process. When a resample includes both treated and control units, the estimated treatment effect, denoted as $\hat{\tau}^{sdid}$, is adjusted and labeled as $\hat{\tau}^{sdid}_{(b)}$ for each bootstrap resample. Subsequently, the bootstrap variance $\hat{V}_t^{(b)}$ is determined by calculating the variance of the adjusted estimates $\hat{\tau}^{sdid}_{(b)}$ across all B resamples.

3.6 Mathematical Expressions for Calculation

$$y_{it} = \alpha + \delta_t + \gamma_i + \beta D_{it} + \theta_1 X_{1,it} + \theta_2 X_{2,it} + \epsilon_{it} \qquad (3.14)$$

In the equation 3.14, the intercept α represents the baseline value of the dependent variable, while δ_t is the time fixed effect captures the fixed effects across the years studied. The unit fixed effect γ_i denotes fixed effects specific to provinces or regions. The variable D_{it} (Treated) indicates whether an observation is in the treated group (1) or the control group (0). The coefficient β estimates the effect of the treatment, serving as the primary focus. Variables $X_{1,it}$ and $X_{2,it}$ represent control variables, typically encompassing interactions like year and region. The error term ϵ_{it} represents the differences between observed and predicted values. These terms form the fundamental components of the SDiD model that we focus on this article.

3.7 Descriptive Analysis and Control Variables for Calculation

Descriptive Analysis of the dependent & control variables can be seen at Table 3.1.

Table 3.1 : Descriptive Analysis of the Variables.

Variable	Obs	Mean	Std. Dev	Min.	Max
Indexes					
HDI	1053	.713	.0596	.428	.869
GDI	972	.865	.0909	.466	.959
IHDI	810	.628	.0435	.467	.713
GII	810	.400	.102	.19	.684

A descriptive analysis table according to the 4 indices to be analyzed is provided. Due to the fact that HDI includes 13 years, GDI includes 12 years, and the remaining indices include 10 years of data, the observation values differ.

In the analysis conducted on 1053 observations, the average HDI value is 0.713. HDI values range from 0.428 to 0.869, indicating significant differences in development levels among provinces. With a standard deviation of 0.0595, most provinces have HDI values close to the mean, although some provinces show significant deviations from the mean.

Overall, GDI has the highest mean and broad distribution, while HDI shows a high mean with a narrower distribution. IHDI, reflecting the impact of inequalities, has a narrower distribution compared to HDI. GII, indicating gender inequality, has the lowest mean and the broadest distribution. However, lower GII reflects positive consequences, it needs to be expected. The differences among these indices provide important insights into the variability of human development and inequalities across regions.

Table 3.2 : Descriptive Analysis for Robustness Check.

Variable	Obs	Mean	Std. Dev	Min.	Max
Indexes					
$HDI_{extracted}$	1014	.710	.0586	.428	.869
$HDI_{specified}$	299	.658	.0633	.428	.785
$GDI_{extracted}$	936	.863	.0917	.466	.959
$GDI_{specified}$	276	.817	.0104	.466	.942
$IHDI_{extracted}$	780	.626	.0429	.467	.710
$IHDI_{specified}$	230	.587	.0457	.467	.692
$GII_{extracted}$	780	.404	.100	.19	.684
$GII_{specified}$	230	.473	.907	.209	.684

The extracted provinces dataset, created by removing the dependent variables of Istanbul, Ankara, and Izmir to eliminate bias, was used for a robustness check. The aim here was to remove the three major metropolises and reanalyze the data. The results are shown in the 5th column of the results section. Additionally, a specified regions dataset was created consisting only of provinces from Eastern Anatolia and Southeastern Anatolia. The purpose here was to form a specific treatment and control group. 6th column includes the specified region approach.

Figure 3.2 : Specified Provinces for Robustness Check.

For the calculation of specified provinces, only the provinces highlighted in Figure 3.2 were considered. The index values used were the same as those in the main calculation, sourced from Appendix A. As stated, the treatment group was formed based on Kayaoğlu's study, specifically the treatment group identified in that study. Consequently, Kilis, Adıyaman, Gaziantep, Kahramanmaraş, Şanlıurfa, Batman, Diyarbakır, Mardin, Şırnak, Malatya, Siirt, Hakkari, and Elazığ were included in the treatment group in different years. The control group consisted of the highlighted provinces in Figure 3.2, excluding these specified provinces.

3.8 Fixed Effects Used in Calculation

Fixed effects were used to analyze the impact of mass migration on economic development, aiming to control for biases caused by regions' own dynamics and time-dependent effects. This allows for a clearer identification of the direct effects of migration on economic development. $Region * Year$ fixed effects control for the changing characteristics of different regions over time and general economic conditions, thus enabling the analysis to focus solely on the effects associated with migration.

The year and region fixed effects used by Turkum (2023) and Aksu et. al. (2018) in their studies have also been applied in this study. Initially, Turkey was divided into 12 regions according to NUTS-1, and dummy variables were created for each region. The $Region * Year$ dummy variable was included as a covariate to measure the robustness of the study.

Figure 3.3 : NUTS-1 Regions of Türkiye (Keskin et. al. 2010).

In the calculation of ATT in the results section, fixed effects are included in the 2nd column by dividing Turkey into 5 regions and creating dummy variables, which are then added as covariates. Although Turkey is officially divided into 7 regions, the calculation was done according to 5 $Region * Year$ as per the literature. Therefore, the provinces were divided and dummy variables were created according to the study by Ergin & Kunst.

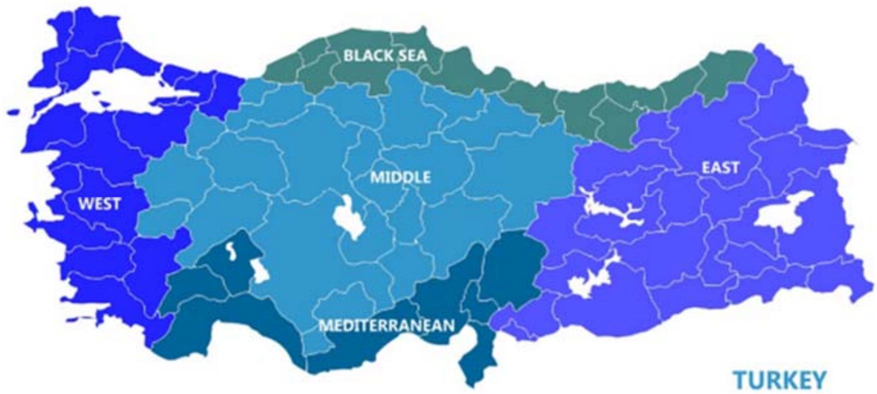


Figure 3.4 : Five-Region Study for the Türkiye (Ergin & Kunst, 2015).

4. RESULTS

4.1 Explanation of the Results Table and Variables Used

In the results section, all data have been analyzed. Separate tables and sections have been created for each index. Calculations according to the SDID, DID, and SCM methods have been included in each index's results table. Additionally, the Average Treatment Effect (ATT) has been calculated by adding dependent variables and fixed effects. In all estimation methods, as stated in Section 2.7.3, a staggered structure was used. Additionally, as described in 3.4.1, results were obtained by averaging different years.

In the results table for each index, Column 1 presents an analysis with no control variables added. In Column 2, the 5 Region-Year Interaction described in section 3.7.1 has been added as a control variable. Column 3 includes the 12 Region-Year Interaction as a control variable. Column 4 presents an analysis with no control variables added and with the three major cities (Izmir, Istanbul, Ankara) removed from the dependent variables. Finally, Column 5 presents an analysis based solely on the provinces in the Southeastern and Eastern Anatolia regions, with no control variables added. Visually, only the calculations of SDID without the inclusion of control variables have been illustrated with graphical images in this section.

4.2 Estimation for the Effect of Immigration on HDI

According to the SDID calculation in Table 4.1, it can be said that immigration has positive effects on development. Although the effect is not very high to increase HDI more efficiently, the HDI points need to be considered. In 2018, all the Turkey’s provinces average mean is 0.750 and difference between the highest point is 0.150. (Ankara is 0.808 which is the most developed province while Ağrı is 0.658 which is the less developed province in the Turkey in 2018, the difference is 23%

approximately). Also, Tekirdağ is in the 22nd place and the HDI point is 0.773. If the Tekirdağ may be increased with 0.002, new ranking will be 18th. So, it needs to be noted that immigrant flow has a positive effect on HDI.

Table 4.1 : Estimation for the Effect of Immigration on HDI.

HDI Estimation Results	(1)	(2)	(3)	(4)	(5)
HDI_{sdid}	0.00205* (2.25)	0.00483 (1.01)	0.00205* (2.38)	0.00226* (2.25)	0.00638 (1,41)
HDI_{did}	-0.00971 (-1,75)	0.00250 (0,46)	-0.00971 (-1,92)	-0.00714 (-1.19)	-0.0237* (-2.56)
HDI_{scm}	0.000352 (0.19)	0.0127 (0.26)	-0.000158 (-0.12)	0.000716 (-0.57)	-0.0299 (-0.44)
Observations	1053	1053	1053	1014	299
Fixed Variables					
5 Region-Year Int.	No	Yes	No	No	No
12 Region-Year Int.	No	No	Yes	No	No
Extracted Provinces	No	No	No	Yes	No
Specified Provinces	No	No	No	No	Yes

Notes: ***, **, and * refer to 1, 5, and 10 % significance levels, respectively

$HDI_{sdid}$is a estimation result for staggered Synthetic Difference-in Differences method, HDI_{did} is a estimation result for staggered Difference-in Differences method, HDI_{scm} is a estimation result for staggered Synthetic Control method

To make comparison between the estimators, ATT calculated for all the methods. Consequently, the only result which is in the confidence interval is SDID method.

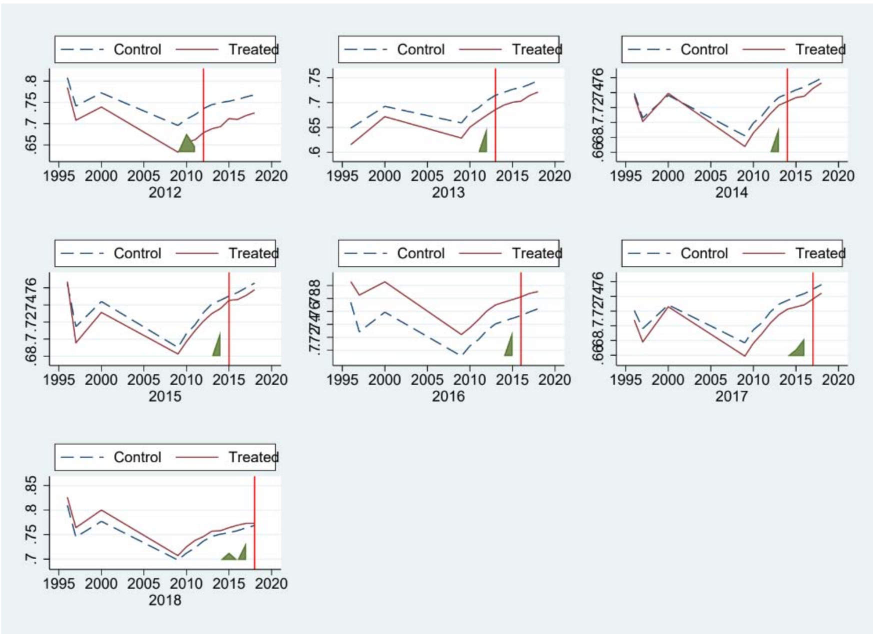


Figure 4.1 : The Visualization of SDID Estimation for the HDI Dataset.

According to the HDI ATT estimation regarding the extraction of three provinces results in column 5, the results is similar to the main HDI estimation. Immigration effects is increased 10% when compared to the main HDI estimation with the same p-value.

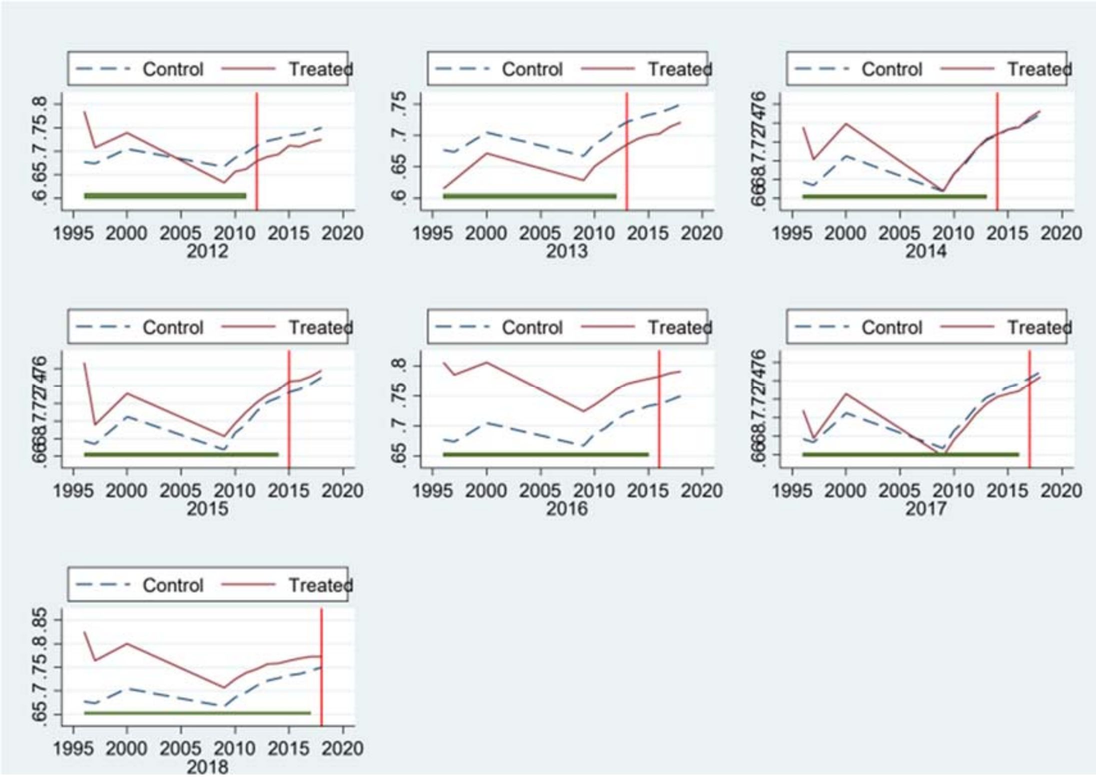


Figure 4.2 : The Visualization of Staggered DID Estimation for the HDI Dataset.

For the specified provinces in column 5, SDID does not give a good estimation while DID do. As mentioned in Section 3 that SDID gives a confident result unless there is a heterogenicity between the control and the treatment group. Therefore, it's important to conduct more detailed and region-specific analyses, considering regional differences and their effects on immigrants. In conclusion, Immigration has a positive effect on HDI.

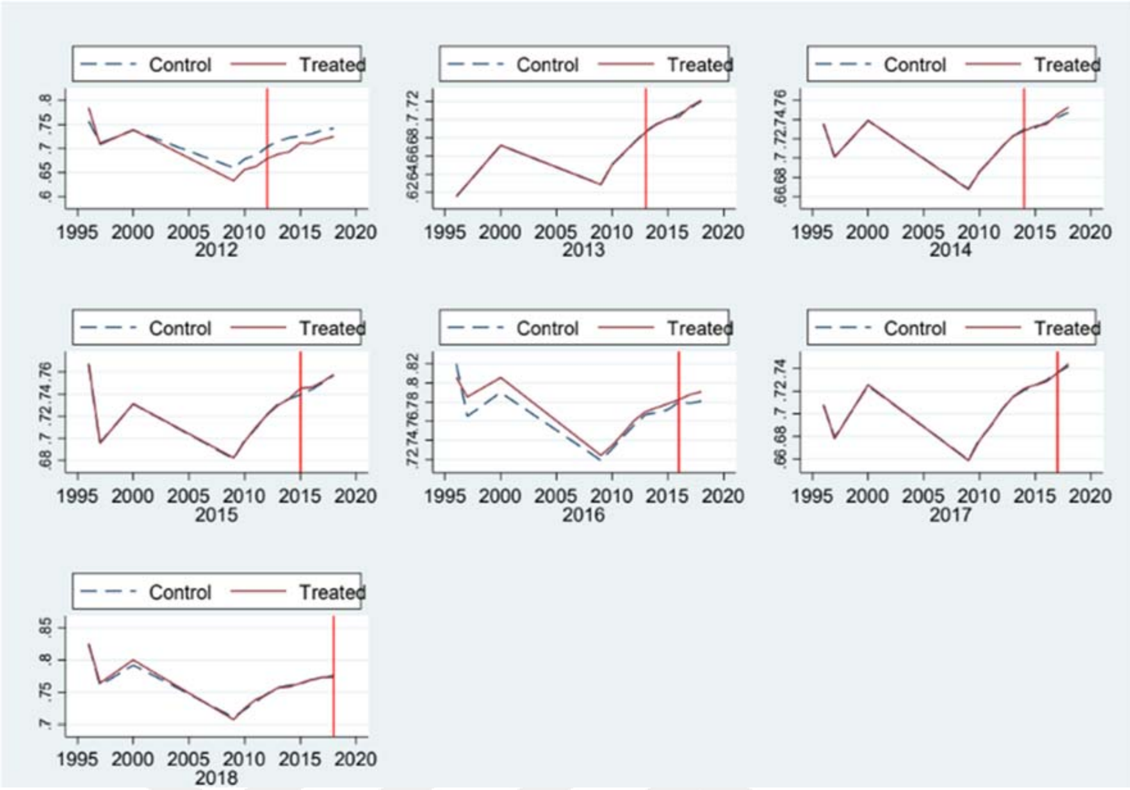


Figure 4.3 : The Visualization of Staggered SCM Estimation for the HDI Dataset.

4.3 Estimation for the Effect of Immigration on IHDI

The calculation of IHDI covers the years 2009 to 2018. Therefore, as mentioned in Section 2, due to the lack of IHDI scores published by UNDP at the provincial level, data from Yiğiteli & Şanlı has been used, and calculations for the period 2009-2018 have been made. The estimation graph for the first column and the unit dot graphs can be observed in Appendix D. For the 4th and 5th columns, the provinces mentioned in previous sections were excluded and analyzed.

Table 4.2 : Estimation for the Effect of Immigration on IHDI.

IHDI Estimation Results	(1)	(2)	(3)	(4)	(5)
$IHDI_{sdid}$	0.00134 (1.07)	0.00133 (1.02)	0.0006 (1.07)	0.0157 (1.40)	-0.00136 (-0.68)
$IHDI_{did}$	0.0132 (0.71)	0.00132 (0.65)	0.0001 (0.06)	0.00212 (1.27)	-0.00075 (-0.26)
$IHDI_{scm}$	0.00089 (0.51)	0.00105 (0.62)	0.0003 (0.12)	0.0008 (0.44)	-0.00194 (-0.61)
Observations	810	810	810	780	230
Fixed Variables					
5 Region-Year Int.	No	Yes	No	No	No
12 Region-Year Int.	No	No	Yes	No	No
Extracted Provinces	No	No	No	Yes	No
Specified Provinces	No	No	No	No	Yes

Notes: ***, **, and * refer to 1, 5, and 10 % significance levels, respectively

$IHDI_{sdid}$ is a estimation result for staggered Synthetic Difference-in Differences method, $IHDI_{did}$ is a estimation result for staggered Difference-in Differences method, $IHDI_{scm}$ is a estimation result for staggered Synthetic Control method

Considering the t-statistics, none of the IHDI estimates are statistically significant in any of the models. The inclusion of explanatory and fixed variables does not result in a notable improvement in model performance.

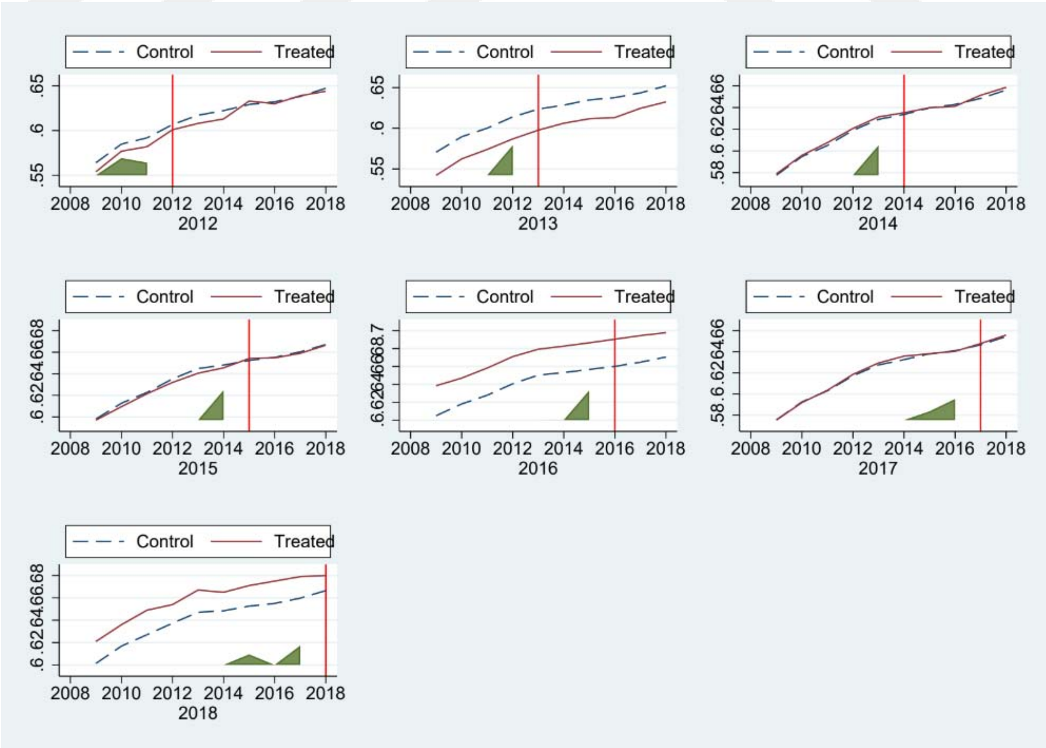


Figure 4.4 : The Visualization of SDID Estimation for the IHDI Dataset.

While different models have been used to estimate IHDI, none of the estimates appear to be statistically significant or economically substantial. The IHDI value is heavily dependent on the HDI, which is one of the reasons for the difficulty in making precise interpretations in the analysis. Even if the inequality rate remains constant, an increase in the HDI would also result in an increase in the IHDI, thus preventing a clear result from being obtained regarding the IHDI. More detailed analysis or different methodological approaches may be necessary to obtain more meaningful results.

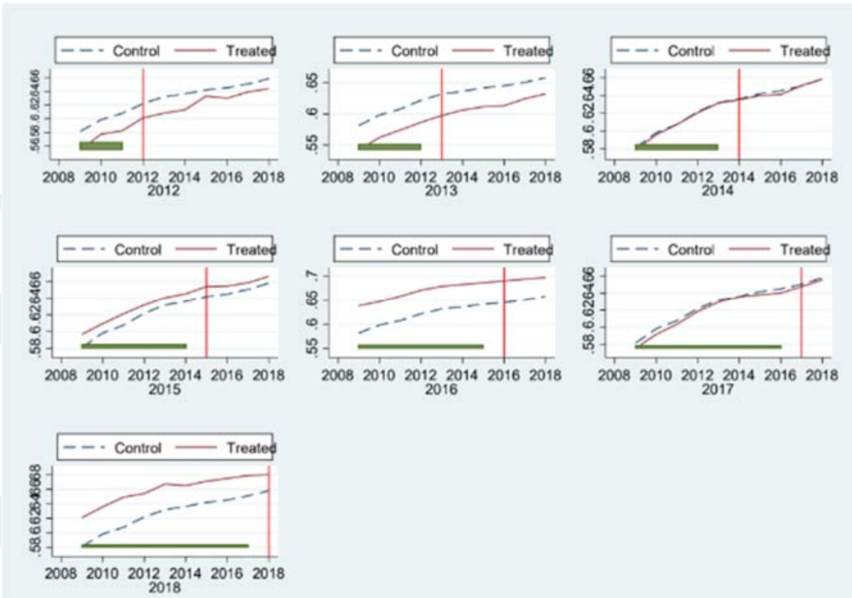


Figure 4.5 : The Visualization of Staggered DID Estimation for the IHDI Dataset.

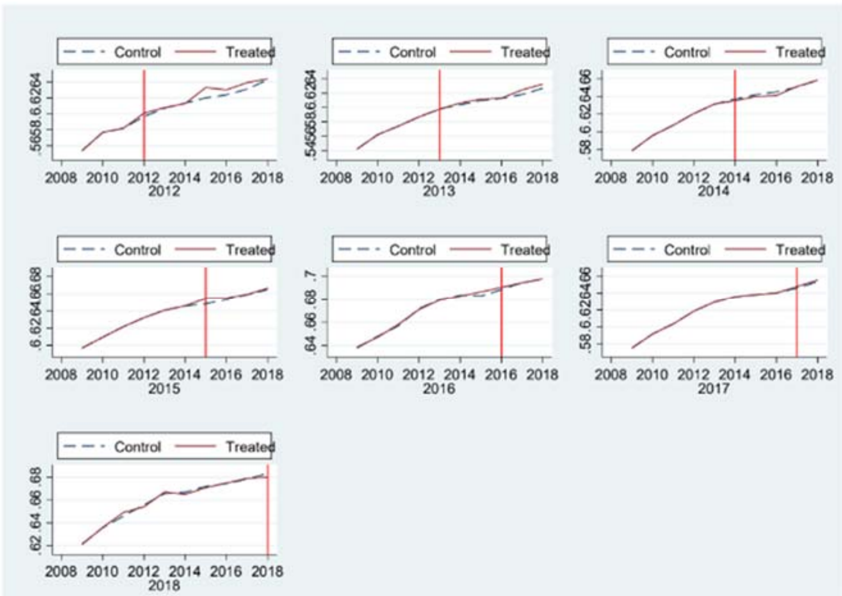


Figure 4.6 : The Visualization of Staggered SCM Estimation for the IHDI Dataset.

4.4 Estimation for the Effect of Immigration on GDI

As mentioned in Section 2, GDI measures the development points between the genders. 1997,2000 is the official dataset from the UNDP while 2009-2018 years from the alternative paper.

Table 4.3 : SDID Estimation Results for Calculating Immigrant Effect on GDI.

GDI Estimation Results	(1)	(2)	(3)	(4)	(5)
GDI_{sdid}	0.00931* (2.41)	0.00931** (2.71)	0.006 (1.39)	0.0104** (2.76)	0.0241* (2.52)
GDI_{did}	-0.00177 (-0.32)	-0.00177 (-0.35)	-0.008 (-1.9)	0.0008 (0.14)	-0.00258 (-0.3)
GDI_{scm}	-0.0005 (-0.18)	-0.00171 (-0.81)	-0.005 (-1.10)	-0.0005 (-0.2)	-0.00726 (-1.02)
Observations	972	972	972	936	276
Fixed Variables					
5 Region-Year Int.	No	Yes	No	No	No
12 Region-Year Int.	No	No	Yes	No	No
Extracted Provinces	No	No	No	Yes	No
Specified Provinces	No	No	No	No	Yes

Notes: ***, **, and * refer to 1, 5, and 10 % significance levels, respectively

$GDI_{sdid}$is a estimation result for staggered Synthetic Difference-in Differences method, GDI_{did} is a estimation result for staggered Difference-in Differences method, GDI_{scm} is a estimation result for staggered Synthetic Control method

The first column's GDI estimation with SDID indicates a positive and significant effect on GDI, suggesting that the associated variable has a meaningful impact.

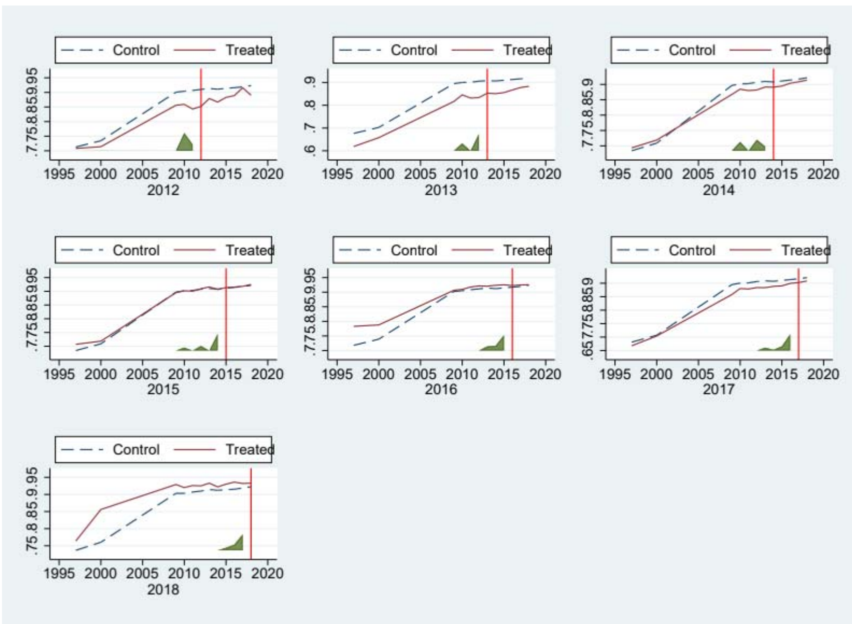


Figure 4.7 : The Visualization of SDID Estimation for the GDI Dataset.

All columns, except 3rd, are statistically significant, suggesting that the associated variables have positive and meaningful impacts on the GDI. These interpretations, except third column, indicate that most of the associated variables and exposed effect (immigration) have statistically significant positive impacts on the GDI, with varying degrees of significance.

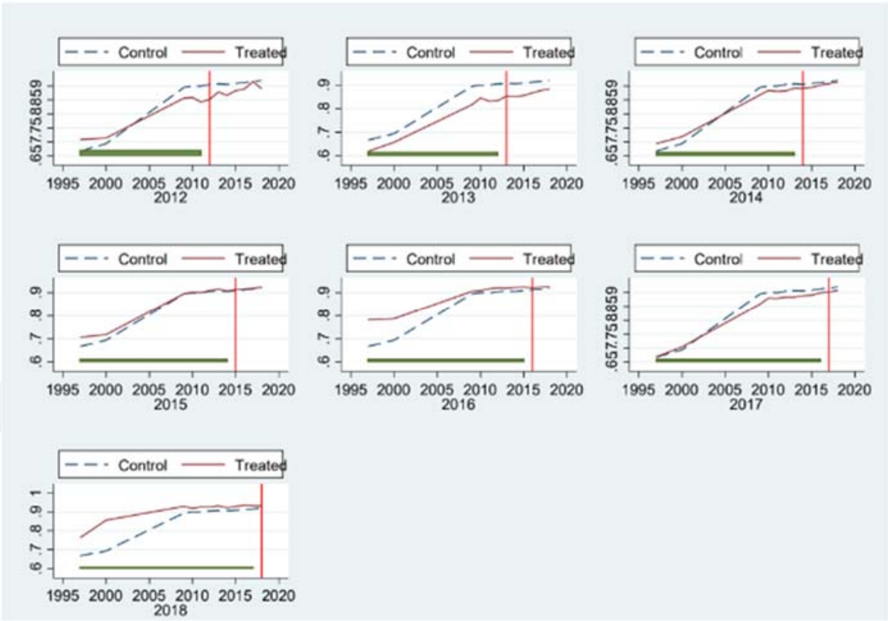


Figure 4.8 : The Visualization of DID Estimation for the GDI Dataset.

The SDID estimation showing a 0.00931 increase in GDI is statistically significant and meaningful. It represents a noticeable improvement in gender development, equating to roughly 1.08% of the mean GDI and about 10.24% of its standard deviation. This increase suggests positive changes in gender equality and development, which have important economic and social implications.

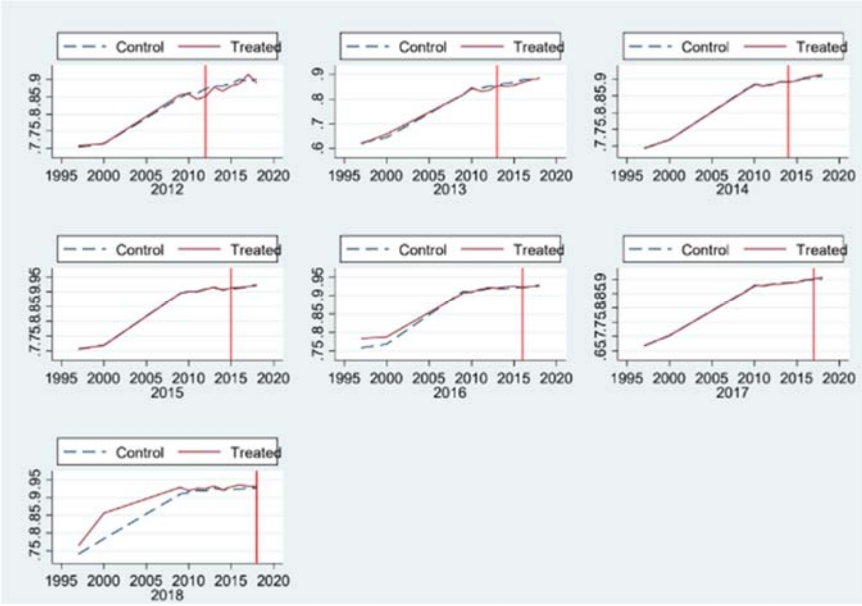


Figure 4.9 : The Visualization of SCM Estimation for The GDI Dataset.

4.5 Estimation for the Effect of Immigration on GII

According to the Table 4.4, immigration decreases the inequalities between the genders in non-significant results. However, it can be noted that the calculation can be trusted. To prevent misleading, SDID estimation results for calculate immigrant effect on GII.

Table 4.4 : SDID Estimation Results for Calculating Immigrant Effect on GII.

GII Estimation Results	(1)	(2)	(3)	(4)	(5)
GII_{sdid}	-0.0104 (-1.70)	-0.0104 (-1.43)	-0.0104 (-1.37)	-0.0146 (-1.87)	-0.0218* (-2.06)
GII_{did}	-0.0133 (-1.59)	-0.0133 (-1.57)	-0.0133 (-1.81)	-0.0175* (-2.12)	-0.00075 (-1.63)
GII_{scm}	-0.007 (-0.80)	-0.0145 (-1.51)	-0.0044 (-0.59)	0.0127 (-1.57)	-0.0015 (0.09)
Observations	810	810	810	780	230
Fixed Variables					
5 Region-Year Int.	No	Yes	No	No	No
12 Region-Year Int.	No	No	Yes	No	No
Extracted Provinces	No	No	No	Yes	No
Specified Provinces	No	No	No	No	Yes

Notes: ***, **, and * refer to 1, 5, and 10 % significance levels, respectively

$GII_{sdid}$is a estimation result for staggered Synthetic Difference-in Differences method, $GIII_{did}$ is a estimation result for staggered Difference-in Differences method, GII_{scm} is a estimation result for staggered Synthetic Control method

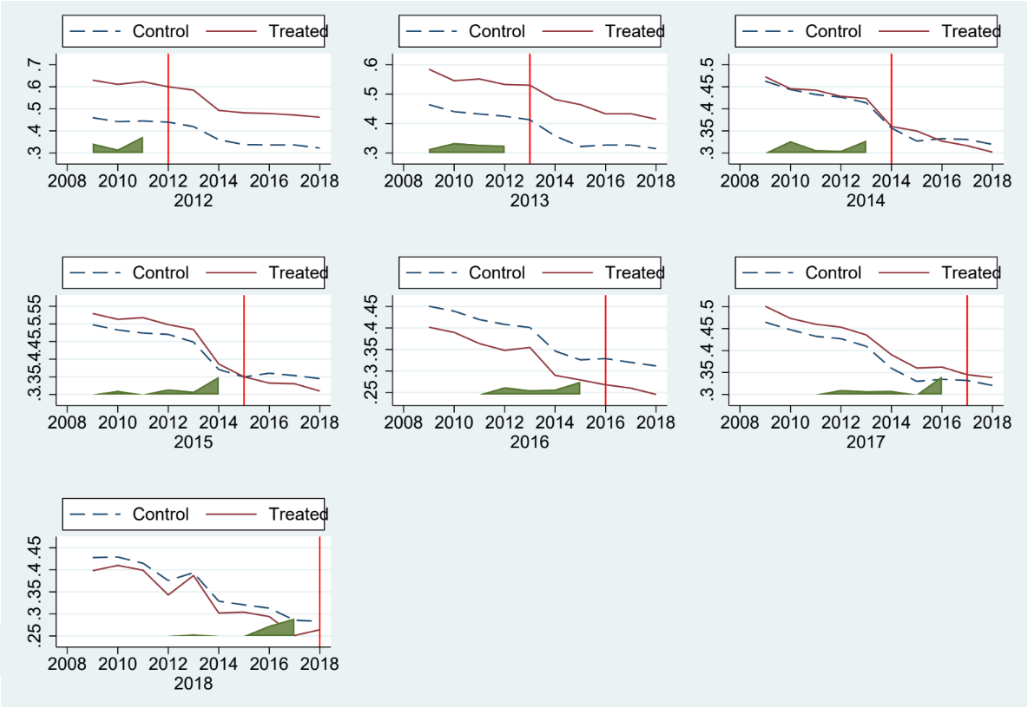


Figure 4.10 : The Visualization of SDID Estimation for the GII Dataset.

When extracted provinces is used to calculate ATT on GII, DID estimation is more trustable then SDID. If the specified group needs to be investigated, the only estimation which make estimation with the confident t score is SDID. As expected, GII significantly decreases with the effect. Therefore, it can be said that effect of immigration has decreased the GII that lower GII point means less inequality between the genders.

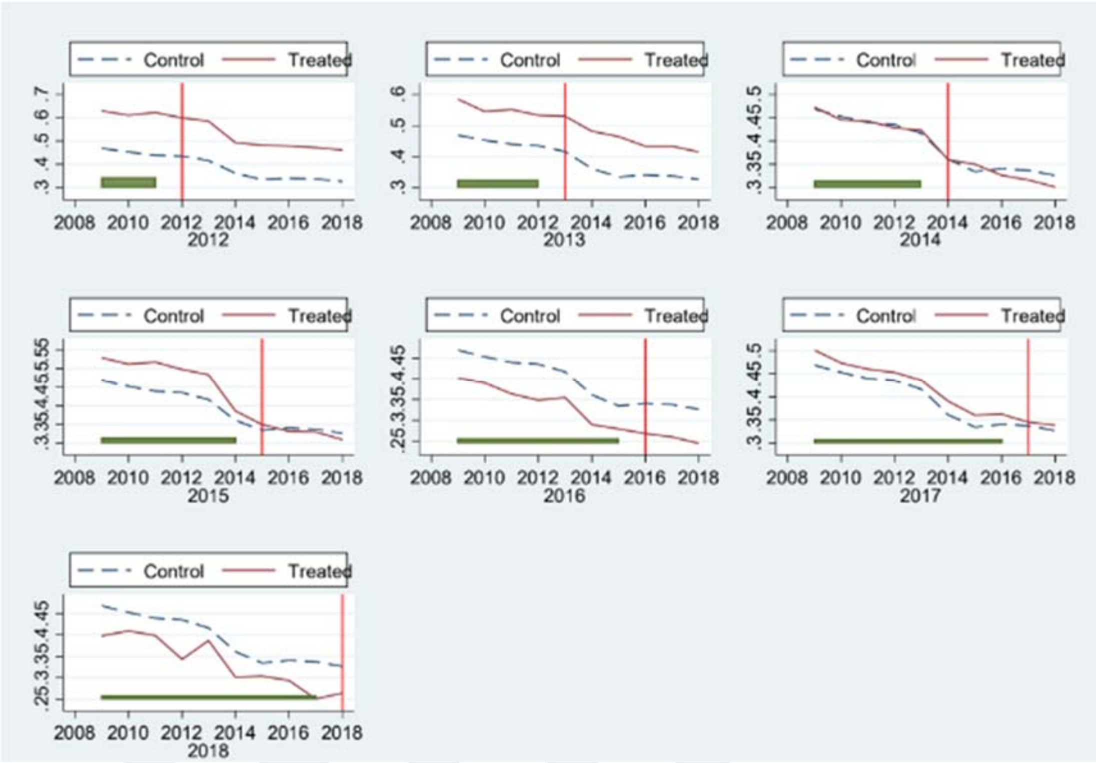


Figure 4.11 : The Visualization of DID Estimation for the GII Dataset.

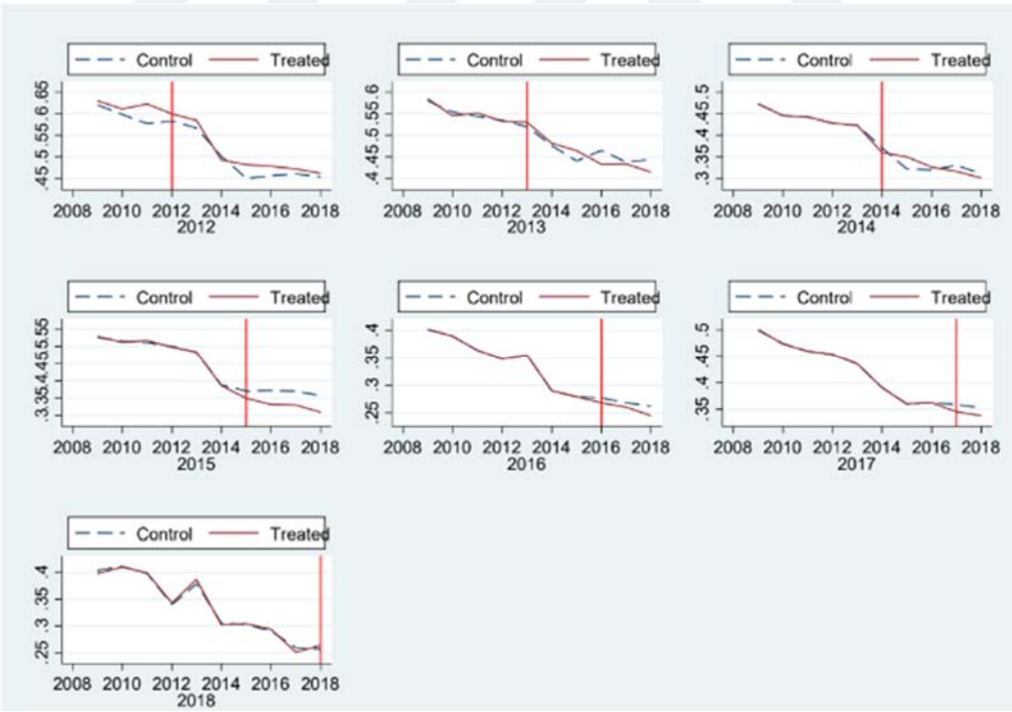


Figure 4.12 : The Visualization of SCM Estimation for the GII Dataset.

5. CONCLUSION

The influx of Syrians to Turkey due to the Syrian civil war has required an evaluation of how much Turkey's socioeconomic structure has changed. Literature reveals numerous studies investigating various socioeconomic variables such as unemployment, GDP, and school enrollment rates. However, there has been a lack of comparison of the effects based on socioeconomic development scores. Additionally, previous studies have not employed the staggered Synthetic Difference-in-Differences (SDID) method in their analyses. The SDID method, which combines the advantages of the staggered Difference-in-Differences (DiD) and staggered Synthetic Control Method (SCM), allows for a more robust estimation. Therefore, this study aims to achieve mathematically more accurate results compared to previous literature. By using socioeconomic development scores as a cumulative indicator and applying the SDID method, this study seeks to analyze the socioeconomic impact of Syrians under temporary protection in Turkey. To further illustrate the robustness of estimation and differences in estimation values, calculations were also conducted using DiD and SCM with the same variables.

In this study, the impact of the refugee influx on Turkey was examined at the provincial level using four different development scores published by the UNDP. The HDI generally reflects the socioeconomic parameters of a province, calculated using three main parameters: school enrollment rate, life expectancy index, and GDP per capita. The IHDI reflects regional inequality in HDI scores. The GDI indicates the impact of women's HDI scores on men's HDI scores in a specific region. The three parameters, HDI, IHDI, and GDI, are derived using the same sub-parameters. The GII, on the other hand, differs from the other three methods by using different sub-parameters, directly indicating gender inequality, such as the proportion of women in parliament and birth rates among women.

While official provincial scores were used, the UNDP stopped publishing them at the provincial level after 2004. However, Yiğiteli & Şanlı (2020) continued the calculation method, providing index calculations for each year between 2009 and 2018. For data until 2004, UNDP's own data was used, and for the years 2009-2018, Yiğiteli & Şanlı (2020)'s index calculations were used. GII and IHDI data are only available for the years 2009 and 2018.

Upon examining the four specified parameters, the impact of refugees on HDI and GDI was found to be positive. Although the effect on GII did not yield highly reliable results within a high confidence interval, the t-score and some calculation with control variables suggest that the impact on GII also points to a reduction in inequality. However, the impact on the IHDI index did not provide reliable results. To measure the effects on HDI inequality (IHDI), deeper analysis and different structural variables may be needed. Furthermore, staggered SDID was observed to produce more reliable results compared to staggered DiD and staggered SCM. In conclusion, it was observed that refugees have made a positive socioeconomic contribution to Turkey.

REFERENCES

Abadie, A. (2021). Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects. Journal of Economic Literature, 59(2), 391–425.

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. Journal of the American Statistical Association.

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. Journal of the American Statistical Association

Akanbi, O. A. (2017). Impact of migration on economic growth and human development: Case of Sub-Saharan African countries. International Journal of Social Economics, 44(5), 683-695. https://doi.org/10.1108/IJSE-07-2015-0190

Akın, Ö., & Reyhanoğlu, M. (2022). Benzerlikleri ve farklılıklarıyla göçmen girişimciler ve mülteci girişimciler: Bir tipoloji önerisi. Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 12(3), 1-31. https://doi.org/10.18074/ckuiibfd.1125093

Aksu, E., Erzan, R. & Kırdar, M.G., (2022). "The impact of mass migration of Syrians on the Turkish labor market," Labour Economics, Elsevier, vol. 76(C).

Athey, S., Imbens, G. W., & Wager, S. (2019). Synthetic Difference In Differences. NBER Working Paper No. 25532. National Bureau of Economic Research.

Ashenfelter, O., & Card, D. (1985). Using the Longitudinal Structure of Earnings to Estimate the Effect of Training Programs. The Review of Economics and Statistics, 67(4), 648-660.

Autor, D., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. Quarterly Journal of Economics, 118(4), 1279-1333.

Aydemir, A., & Kirdar, M.G. (2017). Quasi-Experimental Impact Estimates of Immigrant Labor Supply Shocks: The Role of Treatment and Comparison Group Matching and Relative Skill Composition. European Economic Review 98: 282–315.

Balkan, B., Tumen, S. (2016). Immigration and prices: quasi-experimental evidence from Syrian refugees in Turkey. J Popul Econ 29, 657–686 https://doi.org/10.1007/s00148-016-0583-2

Bertrand, M., Duflo, E., & Mullainathan, S. (2002). How Much Should We Trust Differences-in-Differences Estimates? National Bureau of Economic Research.

Buera, F. J., Kaboski, J. P., & Townsend, R. M. (2021). From Micro to Macro Development

Cengiz, D. & Tekgüç H. (2018). Is It Merely a Labor Supply Shock? Impacts of Syrian Migrants on Local Economies in Turkey. Mimeo.

Carpio, X., & Wagner, M. (2015). The Impact of Syrian Refugees on the Turkish Labor Market. Macroeconomics: Employment. https://doi.org/10.1596/1813-9450-7402.

Caro, L.P. (2020). Syrian Refugees in the Turkish Labour Market: A Socio-economic Analysis. Sosyoekonomi, 28(46), 51-74. https://doi.org/10.17233/sosyoekonomi.2020.04.03

Ceritoglu, E., Yunculer, H. B. G., Torun, H., & Tumen, S. (2017). The impact of Syrian refugees on natives' labor market outcomes in Turkey: evidence from a quasi-experimental design. IZA Journal of Labor Policy, 6(5).

Contreras, S. (2013). The Influence of Migration on Human Capital Development. International Economic Journal, 27(3), 365–384. https://doi.org/10.1080/10168737.2012.659277

Clarke, D., Pailañir, D., Athey, S., & Imbens, G. (2023, Ocak). Synthetic Difference-in-Differences Estimation. IZA DP No. 15907.

Çakır, S., Erbay,E. & Kırdar,M.G., (2023) Syrian Refugees and Human Capital Accumulation of Working-Age Native Children in Turkey, Journal of Human Capital,Volume 17, Issue 4,Pages 557-592,ISSN 1932-8575, https://doi.org/10.1086/726628.

Del Carpio, X. V., & Wagner, M. (2015, August). The Impact of Syrian Refugees on the Turkish Labor Market. Social Protection and Labor Global Practice Group.

Di Maria, C., & Stryszowski, P. (2009). Migration, human capital accumulation and economic development. Journal of Development Economics, 90(2), 306-313. https://doi.org/10.1016/j.jdeveco.2008.06.008

Giovanis, E., & Özdamar, Ö. (2021). The Impact of Syrian Conflict and the Refugee Crisis on Labour Market Outcomes of Host Countries.

Ergin, I. & Kunst, A. (2015). Regional inequalities in self-rated health and disability in younger and older generations in Turkey: The contribution of wealth and education Chronic Disease epidemiology. BMC Public Health. 15. 10.1186/s12889-015-2273-5.

International Organization for Migration (IOM). (2022). World Migration Report 2022.

Kayaoglu, Aysegul, 2022. "Do refugees cause crime?" World Development, Elsevier, vol. 154(C).

Keskin, A., Dağdemir, V. & Demir, N. (2010). Economical analysis of sheep breeding according to the NUTS Level 1 region in Turkey. Scientific Research and Essays. 5. 641-645.

Kugler, M. (2005, September). Migrant Remittances, Human Capital Formation and Job Creation Externalities in Colombia.

Kunwar, L. S. (2015). International migration and development: Perspective from origin countries of migrants. Economic Journal of Development Issues, 15(1-2), 60–75. https://doi.org/10.3126/ejdi.v15i1-2.11865

Massey, D. (1988). Economic Development and International Migration in Comparative Perspective. Population and Development Review, 14, 383. https://doi.org/10.2307/1972195.

Ozyilmaz, A., Bayraktar, Y., Isik, E., Toprak, M., Olgun, M. F., Aydin, S., & Guloglu, T. (2022). The Impact of Refugees on Income Inequality in Developing Countries by Using Quantile Regression, ANN, Fixed and Random Effect. Sustainability, 14, 9223. https://doi.org/10.3390/su14159223

Otite, O. (1979). Rural Migrants as Catalysts in Rural Development: The Urhobo in Ondo State, Nigeria. Africa, 49(3), 226-234. doi:10.2307/1159555

Pearson, R. (2000). Rethinking Gender Matters in Development, in Allen, T. & Thomas, A. (eds.). Poverty and Development into the 21st Century. Oxford: Oxford University Press.

Sweet, S. A. (1994). Work and power in post-Fordist production: A case study of four machine shops. Scholars.unh.edu. https://scholars.unh.edu/dissertation/1796

Ranis, G., Stewart, F., & Ramirez, A. (2000). Economic Growth and Human Development. World Development, 28(2), 197-219. https://doi.org/10.1016/S0305-750X(99)00131-X

Rotte, R., Vogler, M., & Zimmermann, K. F. (2002). South–North Refugee Migration: Lessons for Development Cooperation. First published: 17 December 2002. https://doi.org/10.1111/1467-9361.00008

Sjaastad, L. A. (1970). The Costs and Returns of Human Migration. In H. W. Richardson (Ed.),. Palgrave Macmillan. https://doi.org/10.1007/978-1-349-15404-3_10

Syrian Arab Republic. (2023). Humanitarian Needs Overview. Humanitarian Programme Cycle. (Issued December 2022).

Stark, O., & Wang, Y. (2002). Inducing human capital formation: Migration as a substitute for subsidies. Journal of Public Economics, 86(1), 29-46. https://doi.org/10.1016/S0047-2727(01)00104-9

Tanrıkulu, F. (2021). The Political Economy of Migration and Integration: Effects of Immigrants on the Economy in Turkey. Journal of Immigrant & Refugee Studies, 19(4), 364-377. https://doi.org/10.1080/15562948.2020.1810840.

Turkum, B. (2023). The Effect of Mass Migration on Economic Development. ffhal-04362031.

United Nations Development Programme (UNDP). (2023/2024). Human Development Report 2023/2024 Technical Notes.

The UN Refugee Acency (2021), Global Report 2021

Vandenbussche, J., Aghion, P., & Meghir, C. (2006). Growth, Distance to Frontier and Composition of Human Capital. Journal of Economic Growth, 11(2), 97–127.

Yang, C., Han, H., & Song, J. (2014). Spatial Distribution of Migration and Economic Development: A Case Study of Sichuan Province, China. Sustainability, 6(10), 6509-6528. https://doi.org/10.3390/su6106509

Yiğiteli, N., & Şanlı, D. (2020). Türkiye'de İllere Göre İnsani Gelişme Endekslerinin Hesaplanması: 2009-2018 Kapsamlı Bir Panel Veri Seti. Journal of Economy Culture and Society. ISSN: 2602-2656 / E-ISSN: 2645-8772.

Yunculer, B., Torun, H., Tumen, S., & Ceritoğlu, E. (2017). The impact of Syrian refugees on natives' labor market outcomes in Turkey: evidence from a quasi-experimental design. IZA Journal of Labor Policy, 6, 1-28. https://doi.org/10.1186/S40173-017-0082-4.

APPENDICES

APPENDIX A

KOD	İL	HDI 1996	HDI 1997	HDI 2000	HDI 2009	HDI 2010	HDI 2011	HDI 2012	HDI 2013	HDI 2014	HDI 2015	HDI 2016	HDI 2017	HDI 2018
1	Adana	0,779	0,716	0,751	0,676	0,691	0,702	0,716	0,722	0,731	0,734	0,738	0,745	0,752
2	Adıyaman	0,565	0,606	0,652	0,635	0,652	0,665	0,682	0,696	0,707	0,713	0,713	0,723	0,730
3	Afyon	0,677	0,689	0,715	0,663	0,683	0,691	0,701	0,714	0,719	0,722	0,729	0,734	0,736
4	Ağrı	0,441	0,523	0,572	0,550	0,576	0,581	0,594	0,613	0,622	0,631	0,641	0,650	0,658
5	Amasya	0,706	0,697	0,721	0,698	0,714	0,719	0,734	0,744	0,744	0,753	0,760	0,766	0,768
6	Ankara	0,841	0,782	0,792	0,751	0,762	0,770	0,782	0,791	0,796	0,797	0,801	0,805	0,808
7	Antalya	0,820	0,755	0,788	0,721	0,736	0,745	0,755	0,764	0,769	0,774	0,772	0,779	0,783
8	Artvin	0,795	0,720	0,759	0,707	0,727	0,728	0,749	0,757	0,766	0,771	0,774	0,776	0,783
9	Aydın	0,821	0,749	0,782	0,685	0,700	0,710	0,724	0,736	0,745	0,744	0,749	0,755	0,758
10	Balıkesir	0,834	0,759	0,792	0,697	0,708	0,720	0,733	0,740	0,747	0,748	0,754	0,760	0,768
11	Bilecik	0,820	0,765	0,790	0,719	0,731	0,744	0,756	0,767	0,769	0,772	0,780	0,779	0,781
12	Bingöl	0,484	0,552	0,601	0,595	0,621	0,631	0,651	0,668	0,684	0,697	0,700	0,711	0,720
13	Bitlis	0,459	0,539	0,577	0,585	0,607	0,633	0,645	0,657	0,669	0,678	0,682	0,685	0,693
14	Bolu	0,809	0,739	0,805	0,722	0,735	0,746	0,761	0,769	0,773	0,773	0,780	0,784	0,786
15	Burdur	0,802	0,728	0,746	0,711	0,723	0,732	0,742	0,746	0,748	0,758	0,761	0,764	0,767
16	Bursa	0,863	0,799	0,829	0,704	0,716	0,728	0,744	0,753	0,759	0,764	0,766	0,774	0,779
17	Çanakkale	0,812	0,748	0,782	0,707	0,723	0,734	0,746	0,754	0,757	0,762	0,765	0,771	0,779
18	Çankırı	0,637	0,654	0,681	0,673	0,687	0,709	0,714	0,721	0,729	0,735	0,740	0,746	0,746
19	Çorum	0,758	0,684	0,726	0,659	0,682	0,692	0,706	0,715	0,721	0,729	0,733	0,741	0,748
20	Denizli	0,818	0,746	0,784	0,694	0,713	0,723	0,736	0,750	0,755	0,753	0,758	0,765	0,775
21	Diyarbakır	0,630	0,620	0,668	0,609	0,629	0,643	0,656	0,668	0,676	0,686	0,688	0,702	0,715
22	Edirne	0,805	0,746	0,769	0,704	0,715	0,725	0,736	0,750	0,750	0,750	0,755	0,758	0,765
23	Elazığ	0,730	0,672	0,698	0,670	0,688	0,703	0,714	0,720	0,727	0,734	0,735	0,742	0,753
24	Erzincan	0,582	0,640	0,653	0,690	0,712	0,722	0,739	0,747	0,750	0,752	0,760	0,769	0,775
25	Erzurum	0,639	0,632	0,661	0,637	0,657	0,663	0,677	0,692	0,702	0,707	0,714	0,721	0,728
26	Eskişehir	0,831	0,766	0,787	0,721	0,733	0,742	0,758	0,768	0,771	0,774	0,779	0,787	0,792
27	Gaziantep	0,721	0,697	0,742	0,635	0,656	0,671	0,686	0,697	0,706	0,714	0,715	0,727	0,733
28	Giresun	0,596	0,677	0,688	0,678	0,700	0,706	0,721	0,734	0,737	0,750	0,740	0,748	0,757
29	Gümüşhane	0,586	0,647	0,669	0,672	0,696	0,710	0,710	0,719	0,710	0,709	0,683	0,683	0,706
30	Hakkari	0,450	0,524	0,611	0,579	0,599	0,617	0,631	0,648	0,657	0,662	0,667	0,678	0,692
31	Hatay	0,783	0,711	0,747	0,657	0,684	0,697	0,702	0,715	0,717	0,724	0,728	0,735	0,741
32	Isparta	0,722	0,709	0,724	0,714	0,718	0,728	0,743	0,749	0,753	0,757	0,764	0,769	0,774
33	Mersin	0,793	0,728	0,757	0,687	0,706	0,719	0,729	0,737	0,744	0,748	0,751	0,759	0,765
34	İstanbul	0,856	0,810	0,837	0,727	0,740	0,751	0,764	0,775	0,780	0,786	0,790	0,796	0,802
35	İzmir	0,849	0,798	0,829	0,719	0,736	0,747	0,758	0,771	0,774	0,778	0,779	0,787	0,794
36	Kars	0,539	0,593	0,644	0,612	0,636	0,645	0,664	0,673	0,683	0,693	0,699	0,707	0,717
37	Kastamonu	0,702	0,660	0,704	0,673	0,694	0,705	0,714	0,727	0,730	0,734	0,739	0,746	0,751
38	Kayseri	0,750	0,713	0,746	0,687	0,702	0,711	0,731	0,741	0,743	0,747	0,750	0,760	0,765
39	Kırklareli	0,804	0,750	0,773	0,717	0,730	0,738	0,756	0,757	0,760	0,763	0,771	0,772	0,776
40	Kırşehir	0,725	0,691	0,707	0,680	0,699	0,711	0,728	0,733	0,734	0,742	0,750	0,754	0,755
41	Kocaeli	0,860	0,835	0,869	0,721	0,735	0,752	0,765	0,775	0,781	0,786	0,791	0,799	0,802
42	Konya	0,772	0,723	0,738	0,673	0,687	0,700	0,712	0,727	0,733	0,741	0,742	0,747	0,754
43	Kütahya	0,792	0,707	0,732	0,683	0,698	0,707	0,721	0,730	0,734	0,738	0,742	0,748	0,756
44	Malatya	0,715	0,620	0,706	0,668	0,685	0,699	0,712	0,723	0,729	0,738	0,742	0,748	0,757
45	Manisa	0,810	0,743	0,780	0,683	0,695	0,705	0,724	0,735	0,736	0,741	0,742	0,750	0,755
46	ahramanmar	0,658	0,628	0,674	0,652	0,671	0,682	0,692	0,702	0,710	0,718	0,719	0,729	0,736
47	Mardin	0,555	0,583	0,637	0,604	0,628	0,644	0,660	0,676	0,681	0,690	0,688	0,705	0,713
48	Muğla	0,833	0,775	0,823	0,721	0,732	0,741	0,757	0,768	0,775	0,776	0,778	0,783	0,792
49	Muş	0,447	0,532	0,574	0,563	0,603	0,618	0,627	0,639	0,650	0,653	0,659	0,664	0,677
50	Nevşehir	0,780	0,711	0,735	0,678	0,693	0,708	0,718	0,724	0,733	0,744	0,740	0,745	0,753
51	Niğde	0,734	0,687	0,712	0,660	0,680	0,692	0,708	0,716	0,726	0,728	0,728	0,735	0,741
52	Ordu	0,597	0,649	0,677	0,656	0,680	0,686	0,697	0,713	0,722	0,735	0,732	0,738	0,750
53	Rize	0,763	0,692	0,725	0,698	0,711	0,729	0,743	0,757	0,762	0,767	0,770	0,772	0,784
54	Sakarya	0,847	0,771	0,817	0,688	0,703	0,712	0,728	0,740	0,746	0,751	0,753	0,760	0,765
55	Samsun	0,747	0,713	0,747	0,679	0,694	0,704	0,719	0,729	0,734	0,742	0,744	0,748	0,754
56	Siirt	0,543	0,571	0,636	0,599	0,619	0,636	0,652	0,663	0,671	0,675	0,681	0,692	0,692
57	Sinop	0,654	0,667	0,701	0,674	0,695	0,702	0,717	0,729	0,732	0,736	0,745	0,746	0,751
58	Sivas	0,671	0,679	0,707	0,665	0,684	0,698	0,714	0,721	0,731	0,735	0,741	0,747	0,759
59	Tekirdağ	0,826	0,764	0,800	0,707	0,725	0,738	0,746	0,757	0,758	0,764	0,769	0,773	0,773
60	Tokat	0,657	0,663	0,683	0,644	0,665	0,670	0,688	0,702	0,710	0,720	0,720	0,724	0,730
61	Trabzon	0,732	0,713	0,718	0,702	0,721	0,728	0,744	0,757	0,758	0,768	0,771	0,772	0,779
62	Tunceli	0,604	0,619	0,685	0,698	0,716	0,734	0,755	0,757	0,762	0,765	0,769	0,774	0,785
63	Şanlıurfa	0,552	0,578	0,619	0,581	0,606	0,614	0,621	0,633	0,645	0,653	0,652	0,665	0,672
64	Uşak	0,764	0,720	0,751	0,686	0,707	0,717	0,725	0,738	0,742	0,743	0,748	0,754	0,759
65	Van	0,509	0,570	0,616	0,569	0,596	0,584	0,619	0,629	0,641	0,647	0,659	0,667	0,677
66	Yozgat	0,620	0,639	0,665	0,642	0,662	0,673	0,689	0,700	0,703	0,709	0,714	0,722	0,728
67	Zonguldak	0,788	0,726	0,737	0,669	0,688	0,701	0,715	0,727	0,731	0,736	0,740	0,748	0,750
68	Aksaray	0,606	0,651	0,670	0,648	0,666	0,678	0,692	0,708	0,712	0,723	0,732	0,732	0,741
69	Bayburt	0,572	0,636	0,686	0,656	0,687	0,695	0,708	0,713	0,714	0,725	0,717	0,734	0,762
70	Karaman	0,760	0,695	0,712	0,694	0,700	0,709	0,728	0,749	0,752	0,756	0,758	0,765	0,766
71	Kırıkkale	0,779	0,711	0,720	0,684	0,708	0,719	0,732	0,741	0,739	0,753	0,753	0,765	0,774
72	Batman	0,545	0,590	0,644	0,609	0,638	0,655	0,662	0,674	0,680	0,686	0,690	0,706	0,711
73	Şırnak	0,428	0,490	0,560	0,571	0,599	0,616	0,633	0,647	0,655	0,659	0,655	0,681	0,691
74	Bartın	0,629	0,683	0,702	0,665	0,686	0,694	0,707	0,719	0,726	0,734	0,735	0,739	0,743
75	Ardahan	0,585	0,627	0,655	0,636	0,658	0,671	0,693	0,693	0,699	0,716	0,717	0,728	0,733
76	Iğdır	0,539	0,597	0,632	0,623	0,640	0,655	0,670	0,680	0,688	0,696	0,702	0,716	0,723
77	Yalova	0,800	0,815	0,838	0,711	0,724	0,739	0,753	0,765	0,767	0,773	0,774	0,778	0,779
78	Karabük	0,691	0,701	0,744	0,693	0,709	0,720	0,733	0,746	0,751	0,754	0,759	0,767	0,772
79	Kilis	0,785	0,708	0,739	0,633	0,657	0,662	0,679	0,688	0,693	0,712	0,710	0,719	0,725
80	Osmaniye	0,650	0,676	0,699	0,659	0,680	0,690	0,705	0,713	0,721	0,719	0,728	0,735	0,745
81	Düzce	0,635	0,700	0,735	0,685	0,701	0,709	0,721	0,737	0,742	0,747	0,751	0,759	0,761

Appendix A.1: HDI Points Between the Years.

KOD	İL	GDI 1997	GDI 2000	GDI 2009	GDI 2010	GDI 2011	GDI 2012	GDI 2013	GDI 2014	GDI 2015	GDI 2016	GDI 2017	GDI 2018
1	**Adana**	0,713	0,742	0,899	0,908	0,909	0,908	0,911	0,910	0,910	0,919	0,921	0,923
2	**Adıyaman**	0,597	0,643	0,808	0,829	0,812	0,828	0,858	0,849	0,854	0,855	0,877	0,870
3	**Afyon**	0,682	0,713	0,884	0,900	0,908	0,912	0,912	0,906	0,913	0,918	0,915	0,919
4	**Ağrı**	0,505	0,558	0,872	0,867	0,825	0,859	0,859	0,863	0,874	0,877	0,892	0,895
5	**Amasya**	0,693	0,711	0,919	0,919	0,916	0,909	0,914	0,913	0,920	0,921	0,926	0,932
6	**Ankara**	0,781	0,790	0,910	0,913	0,916	0,923	0,922	0,926	0,928	0,927	0,931	0,930
7	**Antalya**	0,751	0,764	0,931	0,937	0,940	0,943	0,941	0,940	0,940	0,939	0,941	0,941
8	**Artvin**	0,714	0,742	0,926	0,919	0,921	0,923	0,917	0,913	0,933	0,927	0,929	0,940
9	**Aydın**	0,744	0,754	0,933	0,941	0,946	0,953	0,941	0,943	0,945	0,948	0,946	0,950
10	**Balıkesir**	0,757	0,765	0,927	0,925	0,927	0,928	0,927	0,926	0,924	0,931	0,935	0,937
11	**Bilecik**	0,763	0,772	0,908	0,895	0,894	0,907	0,907	0,910	0,912	0,901	0,913	0,915
12	**Bingöl**	0,542	0,593	0,822	0,842	0,813	0,861	0,874	0,856	0,866	0,878	0,889	0,905
13	**Bitlis**	0,526	0,568	0,784	0,816	0,826	0,826	0,825	0,841	0,843	0,855	0,863	0,866
14	**Bolu**	0,735	0,796	0,898	0,902	0,909	0,905	0,918	0,912	0,912	0,916	0,918	0,918
15	**Burdur**	0,724	0,735	0,929	0,925	0,929	0,942	0,927	0,922	0,926	0,930	0,937	0,935
16	**Bursa**	0,796	0,796	0,901	0,901	0,908	0,908	0,917	0,910	0,917	0,919	0,920	0,927
17	**Çanakkale**	0,748	0,766	0,925	0,927	0,926	0,929	0,929	0,924	0,923	0,926	0,935	0,935
18	**Çankırı**	0,649	0,671	0,899	0,913	0,918	0,919	0,908	0,932	0,925	0,930	0,930	0,937
19	**Çorum**	0,677	0,710	0,920	0,915	0,917	0,910	0,912	0,914	0,925	0,930	0,926	0,934
20	**Denizli**	0,741	0,758	0,926	0,927	0,940	0,943	0,938	0,938	0,942	0,942	0,945	0,947
21	**Diyarbakır**	0,604	0,640	0,782	0,800	0,784	0,786	0,825	0,845	0,856	0,867	0,876	0,886
22	**Edirne**	0,746	0,759	0,933	0,944	0,934	0,943	0,936	0,931	0,942	0,943	0,942	0,948
23	**Elazığ**	0,662	0,688	0,860	0,882	0,870	0,891	0,896	0,876	0,884	0,895	0,896	0,899
24	**Erzincan**	0,638	0,652	0,895	0,894	0,886	0,895	0,898	0,892	0,899	0,909	0,905	0,896
25	**Erzurum**	0,624	0,653	0,874	0,888	0,864	0,875	0,885	0,885	0,892	0,895	0,893	0,891
26	**Eskişehir**	0,763	0,770	0,898	0,892	0,902	0,904	0,906	0,905	0,913	0,916	0,918	0,923
27	**Gaziantep**	0,692	0,719	0,849	0,863	0,852	0,864	0,880	0,875	0,886	0,878	0,894	0,888
28	**Giresun**	0,668	0,676	0,937	0,939	0,936	0,941	0,941	0,938	0,932	0,940	0,941	0,942
29	**Gümüşhane**	0,638	0,657	0,948	0,922	0,928	0,926	0,923	0,905	0,912	0,914	0,915	0,913
30	**Hakkari**	0,500	0,590	0,790	0,836	0,828	0,833	0,815	0,836	0,838	0,854	0,869	0,864
31	**Hatay**	0,702	0,728	0,872	0,893	0,899	0,896	0,887	0,875	0,881	0,902	0,899	0,910
32	**Isparta**	0,705	0,710	0,919	0,925	0,927	0,926	0,922	0,926	0,929	0,923	0,929	0,931
33	**Mersin**	0,722	0,743	0,907	0,908	0,915	0,914	0,918	0,914	0,918	0,923	0,926	0,924
34	**İstanbul**	0,810	0,810	0,922	0,922	0,925	0,933	0,936	0,937	0,941	0,942	0,946	0,945
35	**İzmir**	0,795	0,803	0,930	0,934	0,934	0,939	0,946	0,941	0,940	0,942	0,942	0,944
36	**Kars**	0,586	0,640	0,887	0,889	0,883	0,893	0,894	0,907	0,902	0,904	0,901	0,918
37	**Kastamonu**	0,655	0,694	0,909	0,922	0,926	0,918	0,914	0,921	0,926	0,928	0,932	0,937
38	**Kayseri**	0,708	0,732	0,868	0,888	0,904	0,905	0,907	0,899	0,904	0,903	0,909	0,907
39	**Kırklareli**	0,750	0,769	0,921	0,925	0,917	0,924	0,927	0,930	0,932	0,929	0,937	0,937
40	**Kırşehir**	0,684	0,700	0,877	0,889	0,887	0,888	0,895	0,892	0,902	0,898	0,907	0,918
41	**Kocaeli**	0,834	0,839	0,894	0,896	0,907	0,910	0,913	0,911	0,915	0,914	0,918	0,918
42	**Konya**	0,719	0,719	0,897	0,899	0,896	0,891	0,900	0,895	0,903	0,902	0,905	0,912
43	**Kütahya**	0,700	0,714	0,874	0,888	0,892	0,898	0,899	0,905	0,905	0,907	0,904	0,912
44	**Malatya**	0,678	0,692	0,868	0,884	0,877	0,901	0,924	0,898	0,906	0,911	0,919	0,919
45	**Manisa**	0,737	0,755	0,904	0,911	0,919	0,925	0,928	0,928	0,926	0,924	0,927	0,928
46	**ahramanmar**	0,617	0,670	0,853	0,887	0,881	0,875	0,878	0,867	0,874	0,890	0,892	0,902
47	**Mardin**	0,566	0,613	0,766	0,817	0,792	0,790	0,822	0,825	0,826	0,840	0,854	0,864
48	**Muğla**	0,774	0,797	0,940	0,939	0,949	0,949	0,942	0,951	0,947	0,946	0,946	0,956
49	**Muş**	0,541	0,556	0,795	0,829	0,811	0,825	0,826	0,840	0,847	0,845	0,859	0,858
50	**Nevşehir**	0,707	0,728	0,886	0,900	0,900	0,904	0,913	0,911	0,919	0,919	0,912	0,934
51	**Niğde**	0,679	0,704	0,875	0,898	0,900	0,901	0,904	0,908	0,913	0,924	0,919	0,927
52	**Ordu**	0,642	0,662	0,930	0,932	0,936	0,942	0,935	0,930	0,939	0,935	0,945	0,941
53	**Rize**	0,681	0,713	0,943	0,943	0,934	0,942	0,935	0,923	0,931	0,948	0,944	0,950
54	**Sakarya**	0,767	0,783	0,888	0,892	0,902	0,904	0,907	0,910	0,914	0,913	0,914	0,912
55	**Samsun**	0,706	0,729	0,933	0,922	0,932	0,926	0,926	0,927	0,934	0,935	0,937	0,942
56	**Siirt**	0,551	0,608	0,726	0,787	0,760	0,766	0,782	0,799	0,793	0,822	0,828	0,853
57	**Sinop**	0,660	0,690	0,918	0,923	0,920	0,938	0,930	0,928	0,947	0,951	0,949	0,959
58	**Sivas**	0,674	0,689	0,845	0,873	0,886	0,896	0,895	0,880	0,888	0,893	0,894	0,901
59	**Tekirdağ**	0,764	0,780	0,929	0,920	0,926	0,925	0,933	0,922	0,930	0,936	0,932	0,933
60	**Tokat**	0,656	0,673	0,917	0,913	0,913	0,910	0,910	0,902	0,916	0,913	0,913	0,925
61	**Trabzon**	0,704	0,701	0,937	0,945	0,937	0,938	0,936	0,934	0,936	0,944	0,945	0,948
62	**Tunceli**	0,616	0,684	0,859	0,893	0,907	0,921	0,942	0,912	0,886	0,907	0,932	0,926
63	**Şanlıurfa**	0,562	0,598	0,786	0,810	0,772	0,766	0,811	0,830	0,839	0,847	0,865	0,870
64	**Uşak**	0,712	0,729	0,900	0,909	0,920	0,921	0,928	0,920	0,919	0,921	0,929	0,933
65	**Van**	0,551	0,596	0,795	0,825	0,826	0,844	0,829	0,855	0,859	0,856	0,871	0,870
66	**Yozgat**	0,633	0,653	0,863	0,886	0,889	0,898	0,900	0,886	0,890	0,894	0,899	0,901
67	**Zonguldak**	0,719	0,756	0,891	0,888	0,895	0,888	0,901	0,894	0,888	0,893	0,897	0,905
68	**Aksaray**	0,642	0,665	0,876	0,881	0,894	0,898	0,909	0,897	0,906	0,908	0,912	0,926
69	**Bayburt**	0,631	0,670	0,900	0,909	0,864	0,877	0,882	0,903	0,891	0,912	0,901	0,909
70	**Karaman**	0,690	0,711	0,904	0,895	0,895	0,891	0,905	0,890	0,905	0,905	0,903	0,920
71	**Kırıkkale**	0,707	0,716	0,849	0,862	0,862	0,874	0,883	0,883	0,889	0,902	0,895	0,902
72	**Batman**	0,573	0,628	0,740	0,794	0,783	0,765	0,800	0,809	0,803	0,829	0,840	0,862
73	**Şırnak**	0,466	0,543	0,762	0,815	0,776	0,780	0,803	0,814	0,807	0,844	0,858	0,875
74	**Bartın**	0,679	0,685	0,903	0,902	0,911	0,910	0,924	0,916	0,908	0,910	0,908	0,921
75	**Ardahan**	0,624	0,652	0,910	0,906	0,899	0,910	0,917	0,915	0,915	0,908	0,910	0,916
76	**Iğdır**	0,593	0,664	0,909	0,898	0,895	0,901	0,906	0,916	0,920	0,917	0,927	0,921
77	**Yalova**	0,758	0,812	0,903	0,904	0,920	0,927	0,925	0,931	0,929	0,927	0,921	0,923
78	**Karabük**	0,696	0,727	0,911	0,901	0,915	0,921	0,925	0,920	0,907	0,916	0,919	0,917
79	**Kilis**	0,708	0,714	0,856	0,859	0,843	0,852	0,879	0,867	0,883	0,889	0,916	0,890
80	**Osmaniye**	0,623	0,689	0,864	0,892	0,892	0,905	0,893	0,876	0,878	0,905	0,901	0,908
81	**Düzce**	0,652	0,717	0,892	0,895	0,914	0,906	0,911	0,912	0,921	0,921	0,919	0,921

Appendix A.2: GDI Points Between the Years.

KOD	İL	IHDI 2009	IHDI 2010	IHDI 2011	IHDI 2012	IHDI 2013	IHDI 2014	IHDI 2015	IHDI 2016	IHDI 2017	IHDI 2018
1	**Adana**	0,586	0,599	0,611	0,623	0,628	0,637	0,638	0,643	0,650	0,656
2	**Adıyaman**	0,548	0,565	0,577	0,595	0,609	0,620	0,627	0,625	0,637	0,645
3	**Afyon**	0,578	0,595	0,603	0,612	0,625	0,629	0,631	0,637	0,642	0,643
4	**Ağrı**	0,467	0,494	0,498	0,511	0,530	0,538	0,548	0,557	0,565	0,573
5	**Amasya**	0,611	0,624	0,629	0,644	0,654	0,651	0,662	0,667	0,674	0,676
6	**Ankara**	0,661	0,672	0,678	0,689	0,698	0,701	0,703	0,706	0,709	0,713
7	**Antalya**	0,633	0,646	0,654	0,663	0,672	0,676	0,680	0,678	0,685	0,689
8	**Artvin**	0,624	0,643	0,643	0,663	0,671	0,679	0,684	0,686	0,686	0,695
9	**Aydın**	0,605	0,617	0,627	0,640	0,652	0,661	0,658	0,662	0,668	0,670
10	**Balıkesir**	0,605	0,615	0,626	0,637	0,644	0,650	0,650	0,655	0,660	0,668
11	**Bilecik**	0,632	0,642	0,653	0,665	0,675	0,677	0,680	0,689	0,686	0,687
12	**Bingöl**	0,510	0,535	0,545	0,564	0,578	0,595	0,608	0,612	0,621	0,630
13	**Bitlis**	0,496	0,518	0,544	0,557	0,565	0,577	0,589	0,591	0,593	0,601
14	**Bolu**	0,638	0,648	0,657	0,672	0,680	0,684	0,683	0,689	0,695	0,698
15	**Burdur**	0,622	0,633	0,640	0,648	0,652	0,654	0,663	0,665	0,667	0,670
16	**Bursa**	0,619	0,629	0,640	0,655	0,663	0,668	0,672	0,674	0,682	0,688
17	**Çanakkale**	0,612	0,626	0,636	0,648	0,656	0,658	0,661	0,664	0,669	0,678
18	**Çankırı**	0,590	0,600	0,621	0,627	0,633	0,640	0,644	0,651	0,656	0,658
19	**Çorum**	0,571	0,591	0,602	0,615	0,625	0,628	0,637	0,640	0,648	0,656
20	**Denizli**	0,611	0,627	0,637	0,649	0,663	0,667	0,663	0,667	0,674	0,684
21	**Diyarbakır**	0,517	0,535	0,548	0,563	0,573	0,581	0,591	0,592	0,605	0,618
22	**Edirne**	0,619	0,627	0,637	0,646	0,661	0,659	0,658	0,663	0,665	0,673
23	**Elazığ**	0,585	0,603	0,616	0,628	0,634	0,639	0,646	0,645	0,653	0,665
24	**Erzincan**	0,600	0,620	0,628	0,643	0,651	0,654	0,655	0,664	0,671	0,678
25	**Erzurum**	0,553	0,571	0,575	0,590	0,603	0,613	0,617	0,622	0,629	0,637
26	**Eskişehir**	0,636	0,645	0,653	0,668	0,677	0,680	0,682	0,688	0,695	0,699
27	**Gaziantep**	0,558	0,576	0,592	0,608	0,617	0,626	0,634	0,633	0,645	0,653
28	**Giresun**	0,594	0,614	0,619	0,633	0,647	0,649	0,661	0,652	0,659	0,669
29	**Gümüşhane**	0,590	0,611	0,625	0,626	0,634	0,626	0,626	0,604	0,604	0,626
30	**Hakkari**	0,488	0,512	0,526	0,542	0,559	0,566	0,572	0,575	0,585	0,597
31	**Hatay**	0,568	0,593	0,606	0,611	0,623	0,624	0,630	0,633	0,639	0,646
32	**Isparta**	0,624	0,625	0,633	0,648	0,652	0,656	0,659	0,666	0,670	0,674
33	**Mersin**	0,599	0,615	0,627	0,637	0,645	0,650	0,653	0,655	0,664	0,670
34	**İstanbul**	0,637	0,649	0,659	0,670	0,680	0,684	0,689	0,692	0,698	0,704
35	**İzmir**	0,630	0,645	0,654	0,664	0,677	0,679	0,682	0,682	0,689	0,696
36	**Kars**	0,532	0,552	0,559	0,581	0,588	0,596	0,605	0,611	0,618	0,629
37	**Kastamonu**	0,585	0,605	0,613	0,622	0,635	0,637	0,640	0,645	0,651	0,656
38	**Kayseri**	0,595	0,607	0,615	0,636	0,645	0,646	0,649	0,652	0,662	0,667
39	**Kırklareli**	0,630	0,641	0,648	0,666	0,666	0,668	0,669	0,678	0,678	0,682
40	**Kırşehir**	0,595	0,611	0,624	0,641	0,645	0,647	0,654	0,660	0,665	0,667
41	**Kocaeli**	0,637	0,648	0,664	0,676	0,685	0,691	0,695	0,700	0,707	0,710
42	**Konya**	0,587	0,599	0,611	0,622	0,637	0,640	0,648	0,649	0,653	0,660
43	**Kütahya**	0,593	0,606	0,614	0,626	0,636	0,638	0,641	0,645	0,650	0,659
44	**Malatya**	0,581	0,597	0,611	0,623	0,634	0,640	0,648	0,652	0,658	0,669
45	**Manisa**	0,598	0,607	0,616	0,633	0,645	0,644	0,647	0,648	0,656	0,660
46	**ahramanmarı**	0,560	0,578	0,588	0,597	0,608	0,614	0,623	0,623	0,632	0,639
47	**Mardin**	0,522	0,545	0,559	0,577	0,592	0,595	0,604	0,600	0,619	0,627
48	**Muğla**	0,642	0,651	0,660	0,674	0,685	0,693	0,691	0,694	0,698	0,707
49	**Muş**	0,474	0,514	0,526	0,537	0,548	0,559	0,563	0,568	0,574	0,588
50	**Nevşehir**	0,598	0,609	0,624	0,635	0,639	0,648	0,658	0,653	0,658	0,667
51	**Niğde**	0,582	0,600	0,610	0,627	0,635	0,644	0,644	0,643	0,650	0,657
52	**Ordu**	0,572	0,595	0,600	0,611	0,628	0,634	0,647	0,644	0,649	0,661
53	**Rize**	0,615	0,624	0,643	0,655	0,668	0,673	0,677	0,679	0,680	0,695
54	**Sakarya**	0,607	0,619	0,627	0,643	0,654	0,659	0,664	0,664	0,670	0,676
55	**Samsun**	0,594	0,607	0,616	0,631	0,639	0,643	0,650	0,652	0,656	0,663
56	**Siirt**	0,512	0,531	0,549	0,567	0,576	0,583	0,587	0,595	0,605	0,605
57	**Sinop**	0,593	0,610	0,617	0,631	0,642	0,643	0,648	0,656	0,657	0,663
58	**Sivas**	0,571	0,587	0,601	0,617	0,624	0,633	0,636	0,642	0,648	0,660
59	**Tekirdağ**	0,621	0,636	0,649	0,654	0,667	0,665	0,671	0,675	0,679	0,680
60	**Tokat**	0,559	0,577	0,582	0,601	0,613	0,619	0,630	0,629	0,633	0,640
61	**Trabzon**	0,617	0,635	0,640	0,656	0,668	0,667	0,677	0,680	0,681	0,689
62	**Tunceli**	0,608	0,623	0,643	0,665	0,665	0,668	0,672	0,674	0,681	0,692
63	**Şanlıurfa**	0,496	0,517	0,523	0,533	0,544	0,556	0,563	0,562	0,575	0,581
64	**Uşak**	0,598	0,617	0,627	0,632	0,646	0,648	0,649	0,655	0,660	0,665
65	**Van**	0,486	0,511	0,502	0,534	0,543	0,554	0,559	0,571	0,577	0,587
66	**Yozgat**	0,555	0,573	0,581	0,599	0,608	0,610	0,615	0,620	0,627	0,634
67	**Zonguldak**	0,588	0,605	0,616	0,628	0,640	0,643	0,648	0,652	0,660	0,660
68	**Aksaray**	0,566	0,580	0,592	0,608	0,623	0,625	0,637	0,646	0,644	0,655
69	**Bayburt**	0,566	0,598	0,604	0,616	0,617	0,622	0,632	0,626	0,639	0,667
70	**Karaman**	0,608	0,609	0,620	0,636	0,656	0,658	0,661	0,663	0,669	0,669
71	**Kırıkkale**	0,599	0,619	0,631	0,643	0,653	0,649	0,663	0,665	0,675	0,686
72	**Batman**	0,520	0,550	0,567	0,575	0,588	0,593	0,599	0,602	0,619	0,625
73	**Şırnak**	0,475	0,511	0,528	0,546	0,558	0,565	0,572	0,567	0,592	0,600
74	**Bartın**	0,582	0,599	0,606	0,616	0,629	0,637	0,643	0,644	0,647	0,654
75	**Ardahan**	0,551	0,571	0,583	0,606	0,605	0,609	0,627	0,624	0,637	0,643
76	**Iğdır**	0,539	0,552	0,569	0,582	0,593	0,601	0,607	0,613	0,625	0,632
77	**Yalova**	0,632	0,643	0,658	0,671	0,682	0,683	0,689	0,690	0,692	0,694
78	**Karabük**	0,609	0,622	0,630	0,643	0,657	0,661	0,664	0,668	0,676	0,682
79	**Kilis**	0,554	0,577	0,582	0,601	0,608	0,613	0,633	0,630	0,639	0,644
80	**Osmaniye**	0,571	0,588	0,597	0,613	0,620	0,628	0,624	0,634	0,639	0,651
81	**Düzce**	0,602	0,616	0,623	0,633	0,650	0,653	0,656	0,661	0,668	0,670

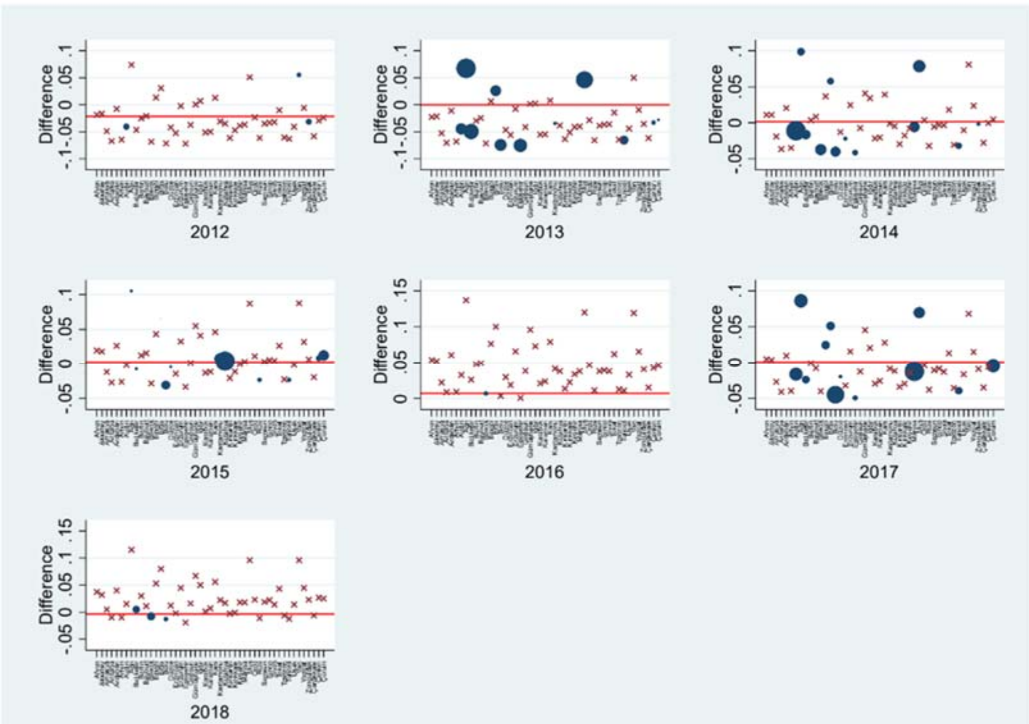
Appendix A.3: IHDI Points Between the Years.

KOD	İL	GII 2009	GII 2010	GII 2011	GII 2012	GII 2013	GII 2014	GII 2015	GII 2016	GII 2017	GII 2018
1	**Adana**	0,416	0,394	0,402	0,375	0,418	0,381	0,353	0,314	0,319	0,304
2	**Adıyaman**	0,618	0,591	0,599	0,573	0,558	0,513	0,501	0,498	0,483	0,469
3	**Afyon**	0,565	0,546	0,542	0,524	0,501	0,474	0,461	0,488	0,437	0,453
4	**Ağrı**	0,534	0,521	0,499	0,521	0,485	0,409	0,393	0,451	0,456	0,447
5	**Amasya**	0,435	0,441	0,419	0,408	0,369	0,339	0,317	0,315	0,309	0,281
6	**Ankara**	0,359	0,346	0,364	0,342	0,316	0,257	0,249	0,240	0,229	0,218
7	**Antalya**	0,406	0,386	0,385	0,355	0,396	0,322	0,303	0,258	0,263	0,239
8	**Artvin**	0,339	0,298	0,308	0,322	0,319	0,259	0,237	0,215	0,272	0,241
9	**Aydın**	0,371	0,362	0,369	0,350	0,337	0,286	0,287	0,319	0,278	0,285
10	**Balıkesir**	0,389	0,412	0,396	0,329	0,377	0,319	0,324	0,313	0,270	0,270
11	**Bilecik**	0,412	0,409	0,350	0,348	0,354	0,345	0,344	0,344	0,319	0,314
12	**Bingöl**	0,560	0,519	0,503	0,498	0,465	0,460	0,366	0,380	0,379	0,364
13	**Bitlis**	0,648	0,605	0,568	0,575	0,581	0,516	0,421	0,456	0,463	0,458
14	**Bolu**	0,376	0,367	0,314	0,308	0,310	0,278	0,272	0,252	0,251	0,257
15	**Burdur**	0,481	0,457	0,463	0,418	0,455	0,349	0,321	0,281	0,291	0,267
16	**Bursa**	0,388	0,393	0,344	0,339	0,346	0,252	0,247	0,243	0,229	0,213
17	**Çanakkale**	0,399	0,412	0,394	0,320	0,366	0,284	0,282	0,275	0,239	0,241
18	**Çankırı**	0,519	0,500	0,486	0,475	0,441	0,368	0,352	0,350	0,342	0,330
19	**Çorum**	0,517	0,522	0,502	0,495	0,442	0,391	0,355	0,363	0,355	0,332
20	**Denizli**	0,430	0,417	0,424	0,404	0,390	0,293	0,292	0,310	0,262	0,279
21	**Diyarbakır**	0,543	0,508	0,524	0,512	0,463	0,386	0,365	0,349	0,344	0,329
22	**Edirne**	0,433	0,458	0,435	0,380	0,410	0,324	0,320	0,319	0,276	0,281
23	**Elazığ**	0,528	0,490	0,471	0,458	0,429	0,450	0,359	0,374	0,365	0,354
24	**Erzincan**	0,497	0,472	0,473	0,504	0,467	0,349	0,332	0,372	0,372	0,379
25	**Erzurum**	0,513	0,497	0,498	0,525	0,486	0,391	0,362	0,415	0,411	0,411
26	**Eskişehir**	0,373	0,374	0,326	0,321	0,328	0,271	0,266	0,262	0,253	0,237
27	**Gaziantep**	0,586	0,556	0,568	0,541	0,533	0,497	0,489	0,484	0,473	0,463
28	**Giresun**	0,393	0,341	0,365	0,378	0,373	0,322	0,275	0,271	0,309	0,290
29	**Gümüşhane**	0,469	0,419	0,431	0,453	0,446	0,351	0,305	0,298	0,325	0,302
30	**Hakkari**	0,554	0,497	0,458	0,467	0,477	0,409	0,305	0,326	0,327	0,317
31	**Hatay**	0,562	0,527	0,528	0,503	0,549	0,451	0,415	0,360	0,368	0,338
32	**Isparta**	0,458	0,439	0,443	0,402	0,440	0,361	0,332	0,294	0,294	0,268
33	**Mersin**	0,406	0,387	0,393	0,367	0,408	0,358	0,325	0,295	0,295	0,276
34	**İstanbul**	0,347	0,311	0,303	0,316	0,282	0,244	0,259	0,230	0,210	0,198
35	**İzmir**	0,313	0,299	0,313	0,301	0,269	0,260	0,258	0,281	0,232	0,246
36	**Kars**	0,569	0,559	0,542	0,557	0,520	0,376	0,358	0,418	0,417	0,403
37	**Kastamonu**	0,455	0,438	0,415	0,406	0,379	0,316	0,292	0,281	0,278	0,264
38	**Kayseri**	0,508	0,506	0,491	0,490	0,447	0,396	0,398	0,362	0,354	0,347
39	**Kırklareli**	0,360	0,376	0,352	0,296	0,343	0,292	0,281	0,274	0,239	0,248
40	**Kırşehir**	0,528	0,523	0,540	0,532	0,476	0,427	0,420	0,385	0,383	0,362
41	**Kocaeli**	0,393	0,381	0,315	0,320	0,328	0,277	0,274	0,273	0,257	0,253
42	**Konya**	0,499	0,499	0,519	0,509	0,484	0,380	0,356	0,355	0,345	0,326
43	**Kütahya**	0,522	0,506	0,488	0,471	0,441	0,372	0,355	0,385	0,338	0,341
44	**Malatya**	0,592	0,549	0,536	0,523	0,502	0,405	0,318	0,328	0,330	0,305
45	**Manisa**	0,449	0,435	0,428	0,412	0,392	0,319	0,314	0,344	0,289	0,302
46	**ahramanmar**	0,554	0,520	0,520	0,491	0,536	0,470	0,435	0,371	0,381	0,350
47	**Mardin**	0,625	0,542	0,551	0,551	0,520	0,448	0,447	0,418	0,424	0,390
48	**Muğla**	0,336	0,328	0,333	0,317	0,305	0,254	0,257	0,278	0,228	0,235
49	**Muş**	0,652	0,610	0,568	0,580	0,585	0,528	0,436	0,475	0,482	0,481
50	**Nevşehir**	0,546	0,547	0,553	0,542	0,496	0,411	0,405	0,365	0,356	0,341
51	**Niğde**	0,543	0,547	0,560	0,556	0,505	0,496	0,489	0,463	0,464	0,450
52	**Ordu**	0,469	0,419	0,445	0,453	0,453	0,357	0,309	0,317	0,361	0,330
53	**Rize**	0,293	0,243	0,251	0,280	0,269	0,243	0,195	0,190	0,238	0,211
54	**Sakarya**	0,432	0,424	0,361	0,359	0,365	0,315	0,304	0,307	0,286	0,287
55	**Samsun**	0,384	0,391	0,366	0,368	0,318	0,326	0,308	0,303	0,295	0,275
56	**Siirt**	0,684	0,610	0,614	0,612	0,579	0,516	0,516	0,479	0,484	0,447
57	**Sinop**	0,372	0,351	0,337	0,325	0,296	0,261	0,244	0,239	0,246	0,230
58	**Sivas**	0,567	0,564	0,547	0,546	0,508	0,461	0,460	0,428	0,425	0,410
59	**Tekirdağ**	0,398	0,410	0,399	0,343	0,387	0,302	0,304	0,294	0,251	0,264
60	**Tokat**	0,529	0,535	0,514	0,511	0,468	0,407	0,384	0,379	0,371	0,356
61	**Trabzon**	0,412	0,361	0,386	0,397	0,390	0,284	0,245	0,240	0,273	0,257
62	**Tunceli**	0,398	0,339	0,355	0,330	0,301	0,332	0,209	0,231	0,257	0,214
63	**Şanlıurfa**	0,603	0,575	0,593	0,585	0,543	0,473	0,456	0,443	0,443	0,433
64	**Uşak**	0,457	0,442	0,442	0,419	0,397	0,351	0,333	0,361	0,309	0,314
65	**Van**	0,615	0,564	0,526	0,533	0,541	0,430	0,330	0,363	0,370	0,366
66	**Yozgat**	0,604	0,595	0,581	0,577	0,536	0,488	0,488	0,453	0,452	0,447
67	**Zonguldak**	0,378	0,383	0,359	0,346	0,301	0,303	0,290	0,289	0,277	0,259
68	**Aksaray**	0,579	0,583	0,590	0,587	0,543	0,467	0,470	0,432	0,432	0,418
69	**Bayburt**	0,536	0,521	0,511	0,540	0,499	0,419	0,384	0,394	0,406	0,403
70	**Karaman**	0,421	0,420	0,430	0,427	0,402	0,387	0,372	0,369	0,362	0,326
71	**Kırıkkale**	0,546	0,532	0,540	0,531	0,475	0,418	0,416	0,372	0,374	0,353
72	**Batman**	0,640	0,559	0,560	0,557	0,523	0,439	0,442	0,404	0,409	0,380
73	**Şırnak**	0,659	0,576	0,582	0,578	0,547	0,460	0,461	0,424	0,430	0,398
74	**Bartın**	0,403	0,418	0,386	0,366	0,333	0,327	0,297	0,291	0,296	0,275
75	**Ardahan**	0,537	0,512	0,502	0,523	0,490	0,412	0,389	0,448	0,455	0,450
76	**Iğdır**	0,493	0,482	0,452	0,476	0,448	0,364	0,358	0,417	0,415	0,410
77	**Yalova**	0,397	0,393	0,333	0,328	0,335	0,265	0,262	0,265	0,261	0,243
78	**Karabük**	0,371	0,377	0,344	0,328	0,284	0,276	0,249	0,259	0,255	0,249
79	**Kilis**	0,630	0,611	0,623	0,600	0,585	0,493	0,482	0,479	0,472	0,462
80	**Osmaniye**	0,508	0,472	0,470	0,450	0,490	0,499	0,464	0,399	0,412	0,394
81	**Düzce**	0,410	0,400	0,337	0,333	0,349	0,295	0,285	0,275	0,264	0,259

Appendix A.4: GII Points Between the Years.

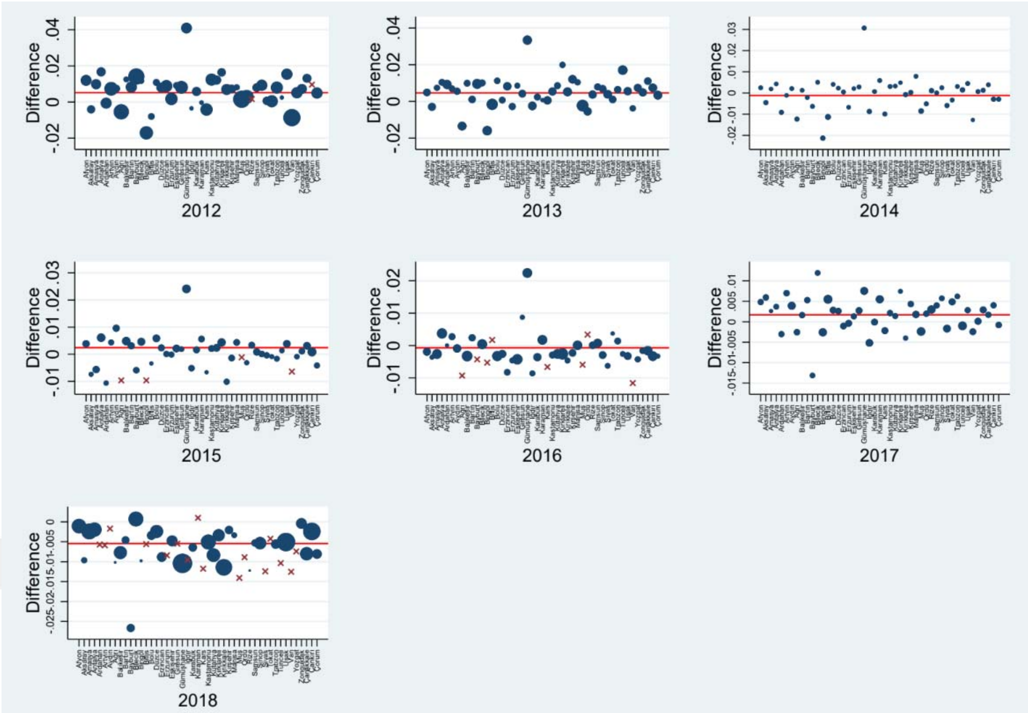
APPENDIX B

Appendix B.1: SDID Unit Weights for HDI Dataset.

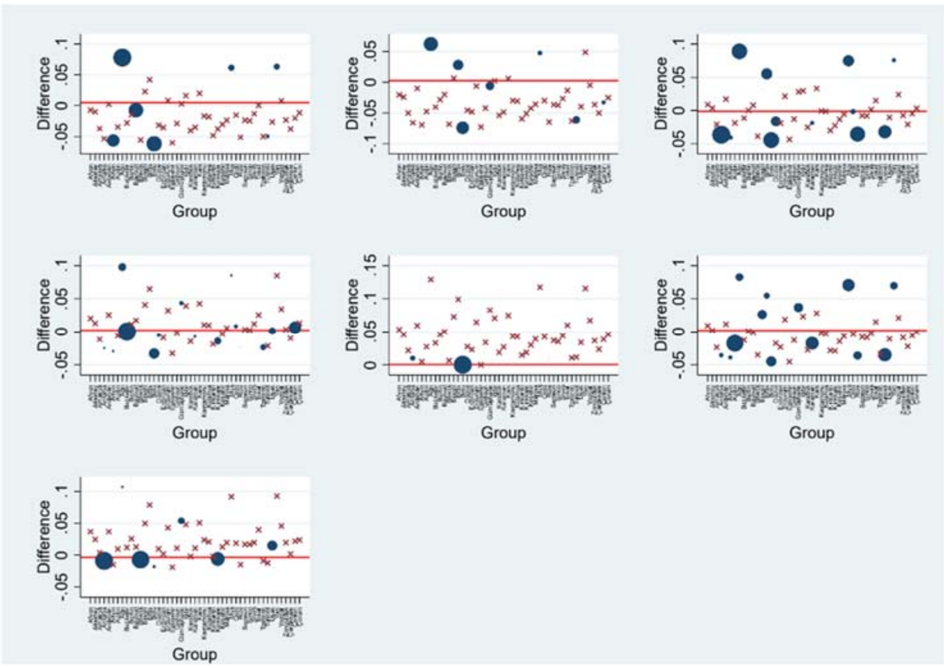


Appendix B.2: SCM Unit Weights for HDI Dataset.

APPENDIX C

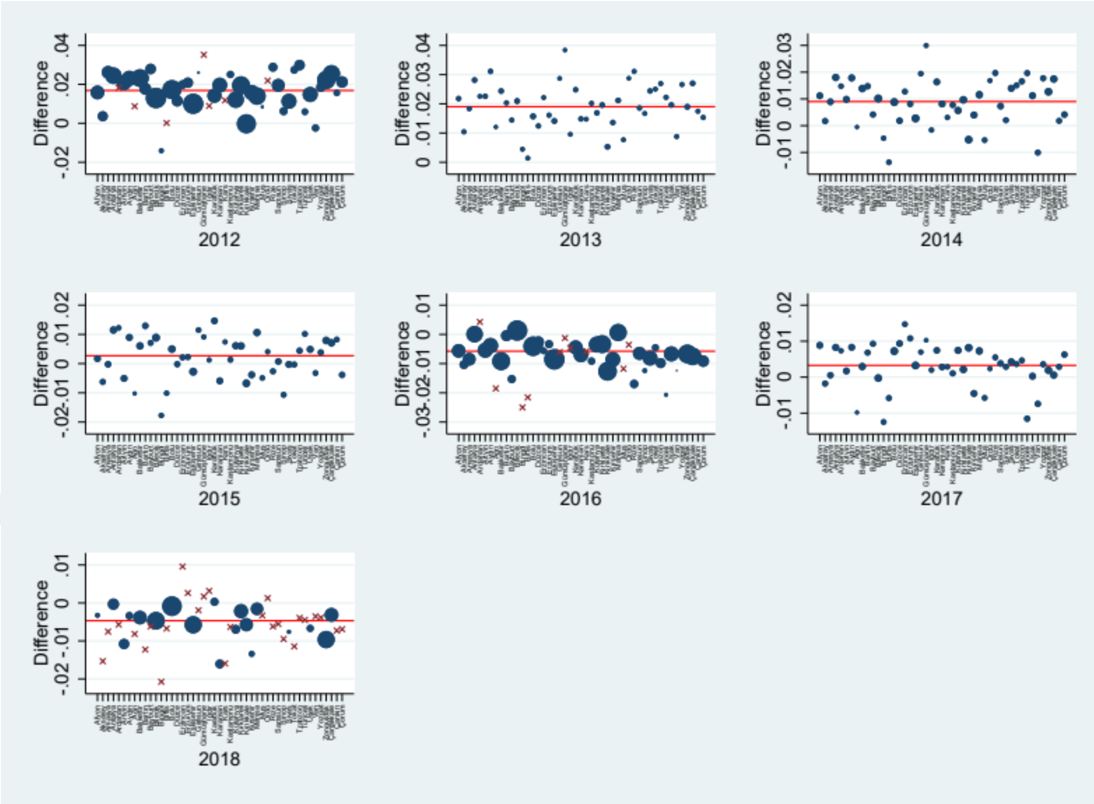


Appendix C.1: SDID Unit Weights for IHDI Calculation.

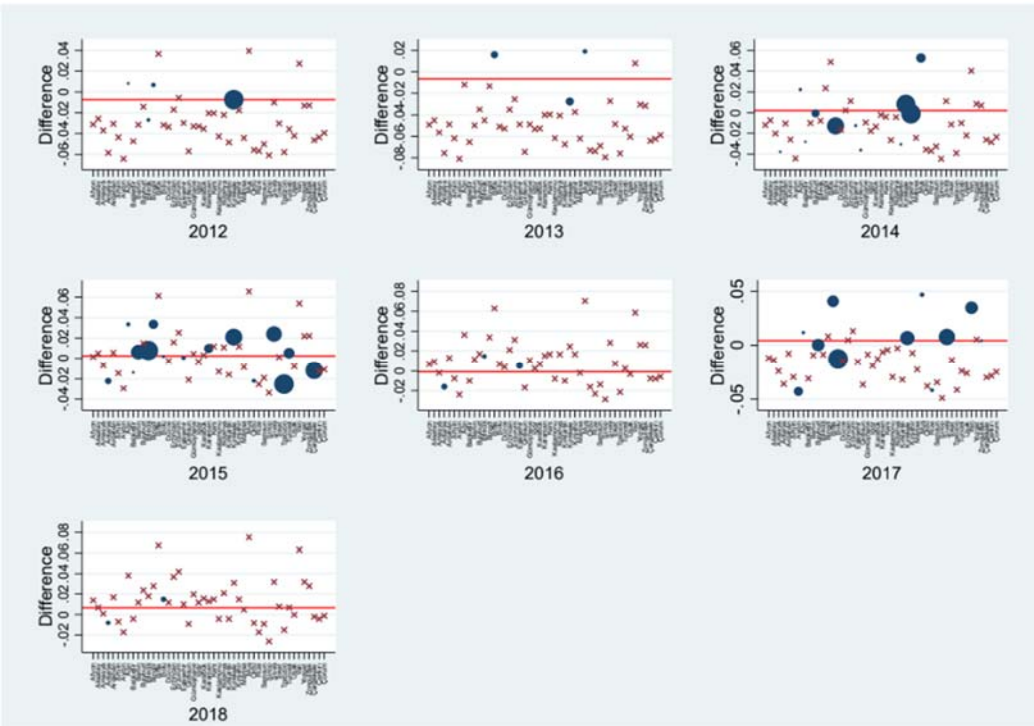


Appendix C.2: SCM Unit Weights for IHDI Calculation.

APPENDIX D

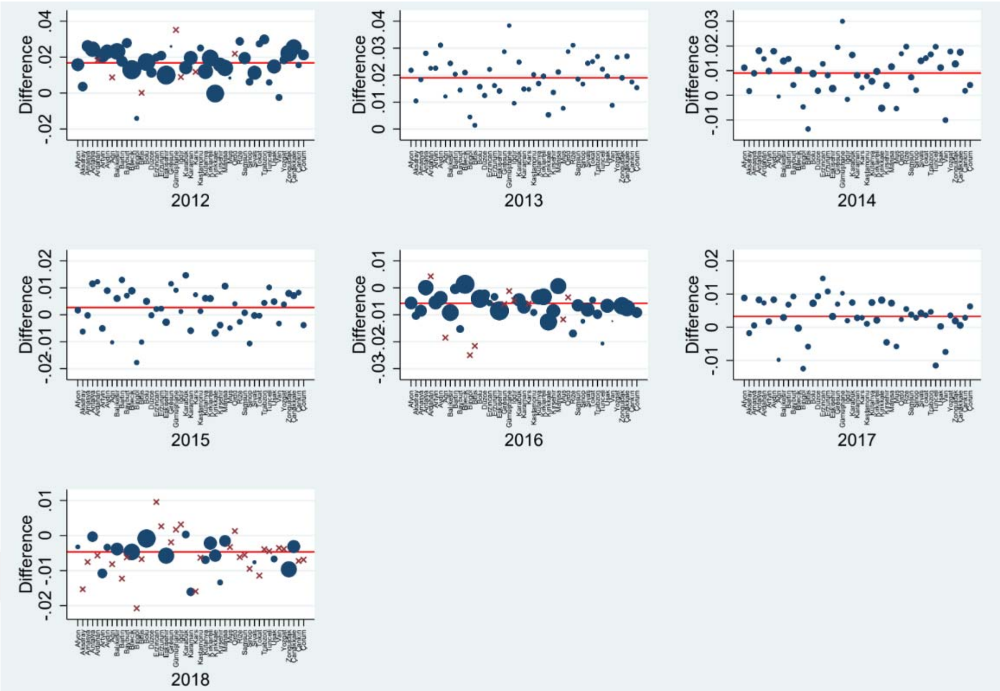


Appendix D.1: SDID Unit Weights for GDI calculation.

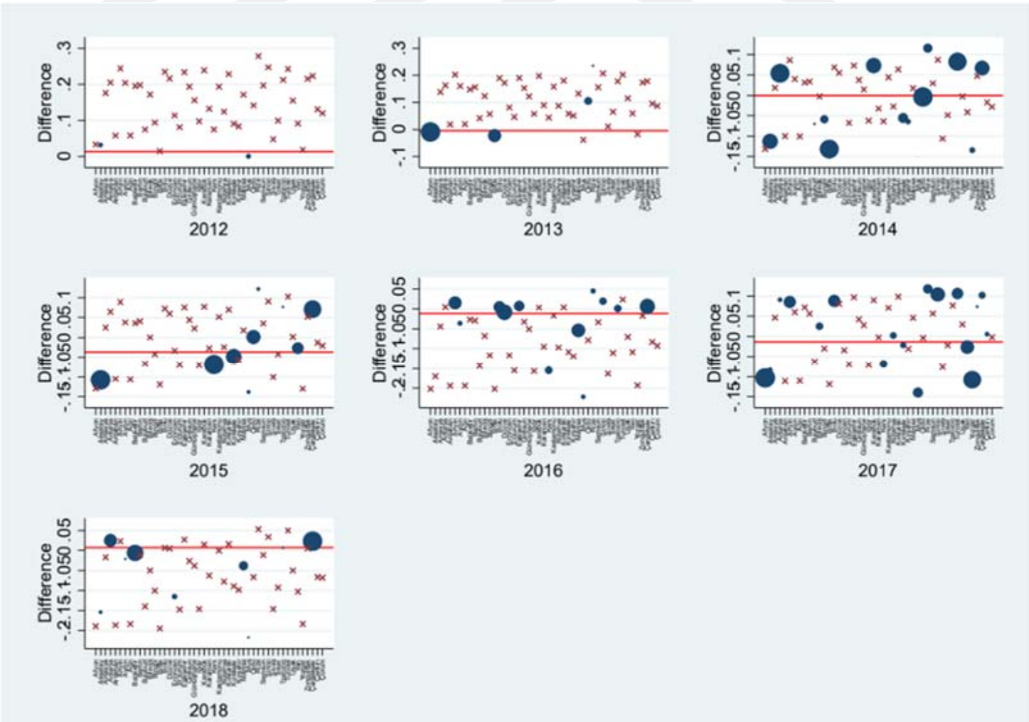


Appendix D.2: SCM Unit Weights for GDI Calculation.

APPENDIX E



Appendix E.1: SDID Unit Weights for GII Calculation.



Appendix E.2: SDID Unit Weights for GII Calculation.

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